SGI Sustainable Governance Indicators

2015 Research and Innovation Report

Research and Innovation Policy

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.

Finland

Score 9

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. Yet, perhaps less so in terms of computer technology and Internet access. Among the EU member states, Finland had the highest R&D intensities in 2013, followed by Sweden and Denmark. However, this position has weakened in recent years. An important role as a source of R&D funding is played by the business enterprise sector. Indeed, Finland's reputation as a high-tech country is well-earned. However, the focus of R&D has been on applied research to the disadvantage of basic research, and universities and other basic research institutes have not benefited. In fact, this has become even more accentuated of late. In the long run, this heavy bias in favor of applied research, given the dependence of applied research on developments in basic research, will have negative consequences for product development and productivity. Moreover, the technology transfer from universities to industry is below par and academic entrepreneurship is not well developed.

Germany

Score 9

Germany's performance in the area of research and development remains positive. Germany ranks seventh in terms of patent applications per inhabitant (Global Competitiveness Report 2014 – 2015: 207). Indeed, according to the World Economic Forum, Germany's capacity for innovation ranks among the world's top performers. In the area of technological development, product and process innovation, the country ranks forth, just 0.2 points behind frontrunner Israel (5.8 points) (Global Competitiveness Report 2014 – 2015).

Regarding funding, the German government continues to raise budgets on research and development. It's spending remains above the European average. In 2013, the government increased the budget of the Ministry of Education and Research by 6%, reaching an all-time high of €13.7 billion (BMBF 2014). In 2014, the budget was once again increased by 2% (to €14.1 billion).

To boost the business innovation budget, the Ministry of Education and Research established a program for small and medium-sized enterprises in 2008. The government plans to increase spending on research and innovation to 3% of GDP by 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. In recent years, medium-sized businesses in particular have contributed to the development of innovation and cluster development increased by 0.1 points from 2013 to 2014, promoting Germany from rank 4 to rank 3. Companies' expenditures on R&D is strong, but public-private partnerships and collaboration between universities and industry leave room for improvement. In the previous Global Competitiveness Report, Germany was ranked 10th out of 144 countries with respect to the quality of its scientific research institutions (a score of 5.6). That was 0.7 points behind top-ranked Israel, but slightly better than countries such as Finland, France and Canada (cf. Competitiveness Report 2012 – 2013: 513). 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. Furthermore, a constitutional change (Art. 91b GG) has facilitated the cooperation of the federal government and states in financing university research. 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. Out of 144 countries, Germany was ranked 8th in 2014 with a score of 5.8, competing with countries such as Japan (5.8 points) and the Netherlands (5.9 points) (Global Competitiveness Report 2014 – 2015: 207).

Citation:
Schwab, Klaus (ed.) (2014): Global Competitiveness Report 2014-2015. 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. This report also points to the constant 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 at encouraging 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:
Goldshmit, Roi, "Information on scientific research and R&D in Israel," Knesset Research Institute, 3.2.2011: http://www.knesset.gov.il/mmm/data/pdf/m02763.pdf (Hebrew)

"Innovation Union Competitiveness report 2011", European commission 2011: http://ec.europa.eu/research/innovation-union/index_en.cfm?section=competitiveness-report&year=2011 p. 155.

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

"Innovation Union Competitiveness report 2011", European commission 2011: http://ec.europa.eu/research/innovation-union/index_en.cfm?section=competitiveness-report&year=2011

"OECD general economic review - Israel," OECD 2011: http://www.mof.gov.il/Lists/List26/Attachments/314/OECD_Dec2011.pdf (Hebrew)

"The CEO of the social-economic cabinet approved the establishment of an authority for technological innovation", Minister of the Economy website 15.9.2014: http://economy.gov.il/Publications/PressReleases/Pages/CabinetForTechnologicalIn novation.aspx (Hebrew)

"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", spokesman for the Ministry of Science, Technology and Space press release 25.4.2013: http://most.gov.il/Information/PostsSpokenman/Pages/report-perry.aspx (Hebrew).

"World Economic Forum: The global competitiveness report 2012-2013, Geneva 2012: http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf

World Economic Forum: The global Competitiveness Report 2014-2015, Geneva 2014: http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.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.

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, as the following points demonstrate.

• Switzerland is at the top of the OECD in terms of per capita publications.

• Switzerland's share of global publications rose between 1981 and 2001.

• Swiss research is among the most-cited in the world.

• Switzerland is among the world's leading nations in terms of patent registration.

• The Federal Institute of Technology Zurich (Eidgenössische Technische Hochschule Zürich) is one of the best universities in the world; the universities of Basel, Bern, Geneva, and Zurich usually show up in the list of the 200 best universities worldwide.

• Swiss products enjoy strong demand in the foreign market, while a similar amount of foreign technology products are imported.

• Swiss companies allocate a significant portion of their assets to research.

However, there are several problems, including:

• a decrease in innovation in recent years (although Switzerland is still one of the most innovative countries in the world);

• the need to improve cooperation between universities and companies;

• weaknesses in social-science and humanities research relative to that conducted in the natural sciences or technological fields;

• a growing skepticism within the population as to the value of cutting-edge research;

• an unclear relationship between the recently created universities of applied sciences and established universities;

• structural friction in coordinating Swiss research programs with EU research policy; and

• very low levels of public spending on research as compared to other countries.

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 latest 2014-2015 report Denmark is ranked 13th, which is an improvement of two places compared with 2013-2014. 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).

Despite this progress, Denmark has experienced a progressive decline in productivity growth, the causes of which are under debate. The government has appointed a "productivity commission" to analyze the issue and to provide specific policy proposals on how to strengthen productivity growth.

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 government has taken various initiatives, including the creation of a Business Innovation Fund, as well as a Globalization Fund.

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

The Danish Government, "Denmark's National Reform Programme," May 2011 (accessed 18 April 2013).

European Commission, European Economic Forecast. Spring
2014.http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee3_en.pdf

Produktivitetskommissionen: www.produktivitetskommissionen.dk

Netherlands

Score 8

The Netherlands moved from 9th in 2009 to 8th in 2014 in the World Economic Forum's 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. The European Union's Innovation Union Scoreboard 2014 ranks the Netherlands as the second best (following Luxemburg) "innovation follower" of 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, and in scientific publication output, finances and support, and intellectual aspects like number of patents. Whether or not this national R&D performance is due to government policies (coordinated by the Ministry of Economic Affairs) is unclear. It ambitiously aims to number among the top five global knowledge economies and to increase public and non-public R&D investments to 2.5% of GDP (€ 650 billion). At present, the Ministry of Economic Affairs oversees €2.1 billion in R&D subsidies, a sum scheduled to increase the next few years to €3.1 billion, of which €1.4 billion is slated for sustainable energy innovation. 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: water, agrofoods, high tech, life sciences, chemistry, energy, logistics, the creative industry and greenhouse agriculture. Whereas specific kinds of R&D support will be replaced by reductions in the overall burden placed on businesses, a special innovation fund for SMEs remains in place. Whereas the chemistry and high-tech industries (DSM, Philips, ASML) are doing well, greenhouse agriculture and the creative industries are lagging.

Citation:
Rathenau Instituut, Innovatiebeleid (www.rathenau.nl/web-specials)

European Commission, Innovation Union Scoreboard 2014 (ec.europa.eu/enterprise/policies/innovation/files/ius-2014_en.pdf)

World Economic Forum,The Global Competitiveness Report 2012-2013 (WEF_GlobalCompetitivenessReport_2012-2013.pdf)

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)

http://zoeken.nrc.nl/article-locations?locations=%7B%22channel%22%3A%22losse-artikelen%22%2C%22medium%22%3A%22web%22%7D&redirect=true&urn=urn%3Anews-item%3Anrchandelsblad%3A20141014%3ANH_ART000000000000000000001428836

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 and accounted for 1% of GDP in 2011. 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 8.5 trillion won (.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 government also uses protectionist measures to help South Korean firms to develop indigenous technologies. One example of this infant-stage technology protection is the requirement that all mobile phones sold in South Korea must support a particular Korean internet platform. Such trade barriers have resulted in the complete dominance of Korean mobile-phone producers in the Korean market, because it is too expensive for foreign firms to design special models just for one country. The government started investing in a modern telecommunication infrastructure early, although more recently it's lost its competitive advantage as other countries have caught up. 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 fundamental research, which is difficult to commercialize. 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 science articles or patents, but a fundamental change based in quality-oriented investment. Yet, the rate of commercialization is still low.

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 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 IT. 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 products and sustainable, larger-scale production that 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 information and communications technology (ICT) spending (which matters more for service industries), to capture a truer picture of innovation effort.

Over the decades, attempts have been made by various governments to improve that situation, linking it to 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), and investing in digital infrastructure and new university research facilities. 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" and the sums involved are considerable, a long-term perspective advises some caution, for similar spurts have been undertaken from time to time, dating back to the Wilson government of the 1960s. Opinions vary as to why past efforts failed. Only in the medium term will the success of this latest initiative be discernible.

United States

Score 8

The United States has traditionally invested heavily in research and development, but the recent 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 has 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.

Citation:
Greenemeier, L. (2014, May 8). What Makes Congress's Latest Effort to Curb Science Funding So Dangerous? Scientific American. Retrieved from http://www.scientificamerican.com

Canada

Score 7

In May 2013, the federal government's Science, Technology and Innovation Council released its biennial review of the nation's science, technology and innovation (STI) performance, arguing that the country continues to tread water as a mid-level performer in STI. Generous fiscal-incentive programs for business R&D (BERD) are available in Canada both at the national and provincial level, and there is significant government financial support for higher-education-based R&D. Canada's low business expenditure on R&D (BERD) 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 issues in the innovation-policy area which may be a cause for concern and merit further study, 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); the impact of cuts to government lab R&D budgets; the inadequacy of government programs in facilitating technology transfer or persuading small and medium-sized businesses to adopt best-practices techniques; and the relationship, or lack thereof, between increased rates of higher education participation and business sector R&D and productivity.

The 2014 federal budget provided for additional funding for research and innovation, including the creation of the Canada First Research Excellence fund, which provides CAD 1.5 billion in funding over the next 10 years for certain post-secondary institutions. This also includes funding for four major research councils. Public policy in Canada appears to have been effective in creating 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 that found Canada's scientific research enterprise to be ranked fourth-highest in the world, after that of the United States, the United Kingdom and Germany, in a survey of over 5,000 leading international scientists. With less than 0.5% of the world's population, Canada produces 4.1% of the world's research papers and nearly 5% of the world's most frequently cited papers.

Citation:
Science, Technology and Innovation Council (2013) Canada's Science, Technology and Innovation System: Aspiring to Global Leadership, State of the Nation, 2012, May http://www.stic-csti.ca/eic/site/st ic-csti.nsf/eng/h_00058.html

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%20publicatio ns%20and%20news%20releases/sandt_ii /stateofst2012_fullreporten.pdf

Estonia

Score 7

Research, development and innovation (RDI) have been strong priorities for national development. The priority position is reflected in a relatively sophisticated set of policies and instruments, and an increase in RDI expenditure over the past several years, which is slowly approaching the EU average. The development and performance of the Estonian innovation system has been remarkable over the past two decades. However, recent evaluations also point to some weaknesses. Policy measures have been much more successful in developing scientific research, as indicated by an increased number of international publications, patents, as well as researchers and engineers. Advances in the development of high-tech products and services are also 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 a vast part of 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. Basically, as with its economic policy more generally, Estonia faces the problems of an overproduction of strategies, a lack of coordination, and difficulty in implementing all its sophisticated programs.

France

Score 7

In research and development policy France performs well. According to the EU Innovation Policy Report, France is ranked eleventh (of 27 EU countries) with respect to innovation capacity; in the report's global innovation index, France performs 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 2.3% of GDP, below the OECD average and far from the EU target of 3%. Whereas public spending on research efforts in France 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 weaknesses are its relatively low private resource mobilization for research and development efforts, 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.

Iceland

Score 7

Combined public and private research and development (R&D) expenditure in Iceland totaled 3% of GDP in 2007, 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, hydrogen power, and genetics and information technology. Public R&D expenditure, 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 was increased by almost 50%, but for 2014 was again reduced by the new government.

Citation:
Research, Development and Innovation in Iceland - 2014 edition. RANNIS - The Icelandic Center for Research

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. The reconstruction of the Northeast and the need to catalyze green technologies are among the major goals mentioned in this context. On top of this, in the summer of 2013 the LDP-led government introduced a "Comprehensive Science, Technology and Innovation Strategy" strengthening various themes: energy, ageing, infrastructure, regions and revitalization after the 2011 disaster. Various measures were selected in 2014 under diverse programs, including Action Plans for S&T Prioritized Measures, a cross-ministerial program and a program on disruptive technologies (ImPACT).

The need to internationalize Japanese R&D constitutes an important challenge. While many attempts at this have already been made, a home bias is still evident. The Fourth Plan recognizes this problem, and makes the case for an East Asia Science and Innovation Area. However, it will be difficult to reconcile the country's various national strategic interests in the region.

In institutional terms, since 2001 the basic policy has been overseen by the Council for Science and Technology Policy (CSTP). This body is headed by the prime minister, signaling the high status of STI questions. In earlier 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 with budgetary power and increased personnel. Program directors are appointed for the various measures. While the recent, somewhat bewildering, variety of measures makes this move plausible, it remains to be seen whether adding an additional bureaucratic layer above ministries will really increase efficiency.

Citation:
Sabine Ganter-Richter, Die neue Innovationsstrategie startet 2014 mit ersten Maßnahmen, Network for Science, 2014, http://www.network-for-science.net/index.php?id=121&L=2

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 39th out of 143 countries assessed in the 2014 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 0.9% in 2012). Moreover, the share of this sum spent by the business sector was very low, totaling just 0.24% of GDP in 2012. 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.

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. 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.

Citation:
The EU Innovation Scoreboard is available at http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/
COMMISSION STAFF WORKING DOCUMENT on the assessment of the 2014 national reform program and convergence program for Lithuania: http://ec.europa.eu/europe2020/pdf/csr2014/swd2014_lithuania_en.pdf.
See Global Innovation Index 2014 at https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2014-v5.pdf

New Zealand

Score 7

New Zealand policy regarding research and development strategies and expenditure (R&D), high-technology employment and patent indicators is clearly deficient, a situation criticized by the Organization for Economic Cooperation and Development (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 has mainly 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 Organization for Economic Cooperation and Development (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.

Citation:
Annual Report 2011-2012 (Wellington: Ministry of Science and Innovation 2012).
Annual Report 2013-2014 (Wellington: Ministry of Business, Innovation & Employment 2014).
Callaghan Innovation: http://www.callaghaninnovation.govt.nz/ (accessed October 13, 2014).
"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

According to a report by consultancy KPMG, Belgium, since it introduced a national interest deduction and a patent income deduction, 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 said. Despite these improved fiscal incentives, however, Belgium remains technologically backwards when compared to Germany or France. While some indicators such as patent registration or monetary returns may be improving, the technological content of the country's exports is progressively eroding, and universities are chronically underfunded (yet despite this, most universities still perform well in terms of creating spin-offs and R&D innovation). Overall research and development spending, which has been largely devoluted to the three regions (Flanders, Brussels, Wallonia) with regards to public funding, remains below 2% of GDP, and like many other European countries, innovations that emerge from these investments rarely translate into commercial successes that would identify Belgium as a technology leader. Yet, qualified personnel is available and fiscal incentives have attracted some research-intensive firms, such as in the chemical, pharmaceutical or, more recently, computer science (such as Google) sectors.

Ireland

Score 6

Support for research, development and innovation (RDI) continues to figure prominently in the rhetoric of Ireland's educational and industrial policies. The state industrial promotion agencies exploit the fact that state aid to industry is compatible with EU policy, provided that it fosters RDI.

While policy is supportive of research and innovation in 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 has continued during the economic crisis and is contributing to the country's current accelerating growth. The location of these activities in Ireland has created opportunities for innovative small Irish firms to develop technologies to supply inputs to the new foreign-owned firms.

The adequacy of the throughput of graduates with the skills sought by new firms in biotechnology and IT remains an issue. Many of the new high-tech firms located in Ireland have to recruit employees from abroad to meet their skill needs.

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

After scrapping the so-called double Irish tax facility in the 2015 budget, the government is planning the introduction of a new "knowledge box" scheme, entailing a preferential (6.25%) tax rate for profits deriving from patents managed from and located in Ireland. This too may prove controversial with Ireland's European partners.

Luxembourg

Score 6

Luxembourg falls below the European average for research and development investment, having spent 1.63% of GDP for its purpose in 2012 (EU-27 average: 2%). The country thus needs to improve research efforts. Luxembourg's four public research centers (now three, thanks to mergers) have lagged far behind international academic standards for decades.

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 persisted in a mode of continuous expansion, and will progressively

move into the new Campus City of Science in Esch-Beval. The House of Innovation already offers space for 500 scientists and researchers from CRP-Henri Tudor, Luxinnovation and the Dr. Widong Centre. Unfortunately, government funding will decrease in 2015, totaling €105 million less than the university applied for. Consequently, the institution is seeking external funding. Conceding that a strong ICT based information society will be necessary to be competitive in global markets, 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.

The Chair on Social Business and Social Management of the University of Luxembourg will open new perspectives and seek innovative answers to societal challenges, promote social enterprises and help stimulate start-ups, thus addressing economic, political and social development as it seeks to enhance economic sustainability.

In its Europe 2020 Strategy, the Luxembourgish government set a goal of raising public expenditure on research and innovation from 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 are provided with financial incentives designed to support R&D business projects in Luxembourg.

Citation:
http://www.cedies.public.lu/fr/legislation/Loi-du-24-juillet-2014.pdf
http://www.cedies.public.lu/fr/legislation/Reglement-grand-ducal-du-27-aout-2014.pdf
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.heritage.org/index/country/luxembourg
http://www.innovation.public.lu/catalogue-publications/rdi-luxembourg/competitivite-statistiques/pnr-2014.pdf
http://www.odc.public.lu/actualites/2014/10/Bilan_Competitivite_2014/Presentation_bilan_2014.pdf
http://www.odc.public.lu/publications/pnr/2013_PNR_Luxembourg_2020_avril_2013.pdf
http://www.odc.public.lu/indicateurs/tableau_de_bord/index.html
http://www.snci.lu/files/55293.pdf
http://www3.weforum.org/docs/GCR2014-15/Luxembourg.pdf
For further informations: http://portal.education.lu/etudes/Home.aspx

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 showed their first results during the period under review, as private-sector R&I expenditures went up by 17.8% compared to the previous year. However, Poland still scored poorly in the EU's 2014 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.

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. However none of the world's top 500 corporate R&D investors is based in Austria, according to OECD data.

Czech Republic

Score 5

Public expenditure on education, science and innovation is below the EU average, but has grown in the period under review. In 2013 and 2014, large research and development infrastructure projects were developed in various regions, but future sustainability will depend on spending from current state budgets, which has yet to

be guaranteed. Recognition of the importance of research has been reflected in the Sobotka government's introduction of the position of deputy prime minister for research and development. Trust in the Czech Science Foundation (GAČR), the largest public funding body for primary research, suffered a heavy blow in April 2014 when it was revealed that the foundation's executive committee had preferred projects found to be tied to its (then) acting president over two much higher rated, competing projects. In comparison to their Western counterparts, private companies in the Czech Republic have little involvement in research and development at universities and research institutions, spending less than 2% of their budgets in pursuing such activities. There is also weak government support for start-up companies. The main means of transferring scientific discoveries into products and enhanced productivity is inward investment by multinational companies, bringing in innovations to the Czech Republic that were developed elsewhere.

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. Research policy is nonpluralistic, government-led, and is not strongly oriented toward enterprise or innovation. One notable exception is in innovative company-based research on the elimination of CO2 emissions in gas exploitation, particularly with respect to carbon capture and storage. 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. 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 universities. These include: Aveiro University, the Faculty of Medicine at Coimbra University, Faculty of Engineering at Porto University, Advanced Technical Institute of Lisbon, New University of Lisbon (Faculty of Sciences and Technologies at Monte da Caparica), University of the Algarve, University of Minho, etc.

The European Union's Innovation Union Scoreboard classifies Portugal as a "moderate innovator," and indicates that Portugal has grown in terms of R&I in the 2006 – 2013 period. It is thus classified as an "innovation growth leader" in this period.

However, this average over the overall 2006 –2013 period 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 also curtailed private investment in R&D. While Portugal's Innovation Index score for 2013 rose somewhat when compared to the previous year (0.410 in 2013; 0.402 in 2012), it still remains considerably below the pre-bailout level (0.420 in 2010). Portugal has been diverging from the EU average since 2011, and in 2013 saw its distance from the EU average grow for the third consecutive year (whereas between 2006 and 2010, this gap was shrinking).

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 the program's existence demonstrates an awareness of the need to harness R&I for this purpose.

Citation:
European Union,"Innovation Union Scoreboard 2014
Lista das instituicoes de ensino superior em Lisboa, 2014

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 2012 was 0.92%. Commercial enterprises account for the largest share of R&D expenditures, at 45.5%. While universities accounted for 43.9% of spending on R&D, public institutions' share was 11.3%. In terms of financial contributions to R&D projects, commercial enterprises have the largest share with 46.8%, followed by public institutions with 28.2%, universities with 21.1%, and foreign sources 0.6% of R&D. In terms of full-time employment, 105,122 people worked in the R&D sector in 2012, an increase of 13.3% compared with the previous year. 49.7% of R&D personnel were employed by commercial enterprises, while 38.8% worked at universities, and public institutions employed 11.5% 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 two annual SCST Meetings in June 2013 and 2014, an emphasis was placed on intensifying R&D efforts in the energy, health and biotechnology sectors.

A new law requires incubation centers and technology-transfer offices to be established in technoparks, and these centers and offices have become eligible to benefit from the incentives provided to the technoparks.

Citation:
European Commission, Turkey Progress Report, October 2014, http://ec.europa.eu/enlargement/pdf/key_documents/2014/20141008-turkey-progress- report_en.pdf (accessed 5 November 2014)
Ministry of Development (2014)'Pre-Accession Economic Program 2014-2016", Ankara.
Ministry for EU Affairs (2013)"2013 Progress Report prepared by Turkey", Ankara.
Şimşek, M. (2014) 'How Turkey Should Escape the Middle Income Trap?' Wall Street Journal Turkey (October 1, 2014).

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. For example, in May 2014, the government announced a $27 million cut to the annual budget of the national science agency, the Commonwealth Scientific and Industrial Research Organisation, and abolished a number of innovation and commercialization programs, including Commercialisation Australia, which provided financial assistance to researchers and inventors looking to commercialize innovative intellectual property. The Abbott government has also 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 is that, under the Abbott government, for the first time since 1931 there is no science minister. Somewhat contrasting is the aim of the Abbott government to establish a medical research fund with a volume of AUD 20 billion (1.3 percent of GDP).

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.

Chile

Score 4

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 in basic research at least. But this good basic research almost never completes the steps required to pursue applied research. 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.

Citation:
http://www.expansiva.cl/media/en_foco/documentos/17032010150429.pdf

Cyprus

Score 4

Cyprus did not have a tradition of research and development within state-owned non-academic institutes until the 1990s. The creation of the first university (1992) and subsequently of other tertiary-education institutions with accredited programs, often drawing on EU funds, marked the beginning of research projects. The share of R&D expenditure accounted for by higher education today (49.6%) remains larger than that of 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, while proportionally more enterprises receive 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 weakness of the private sector and the small size of most companies provide little opportunity for R&D activities. With respect to government expenditure on R&D, Eurostat ranked Cyprus 23rd among the 28 EU member states in 2013.

Project funding was negatively affected by the economic crisis in the period under review. Providing tax incentives for profits and royalties from exploitation of intellectual property rights could indirectly help research. According to a 2013 country report from the European Commission for 2013, businesses have limited demand for R&D and little propensity to innovate, while the number of high-tech companies is limited. This is another sign that research should be given a higher priority. A National Committee for Research, Innovation and Technological Development was created in fall 2013 to study ways of promoting research.

Citation:
1. Budget spending on R&D,
http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsc00007&plugin=1
2. ERA report on Cyprus for 2013,
http://erawatch.jrc.ec.europa.eu/erawatch/export/sites/default/galleries/generic_files/file_0512.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. Public funding for universities and research has been drastically cut. 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 put more emphasis on R&I. For instance, it 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), which commenced operations in January 2015.

Italy

Score 4

In recent years, Italian governments' research and innovation policies have been weak, underfunded and not strategically coordinated. The governments of the period under examination (essentially the Letta and Renzi governments) have not been able to make much headway I 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. Some steps have been taken to link a proportion of university funding to the quality of research outputs. This policy is intended to incentivize universities to generate more quality research.

Malta

Score value_6

Business research and innovation (R&D) have gained in importance in Malta in recent years, notably as a response to the decline in low value-added manufacturing. Yet the National Research and Innovation System, as well as the policies and structures for its development, are still in the early stages. The National Strategic Plan for Research and Innovation 2011 – 2020 highlights the importance of placing R&D activities at the center of national economic policies and endeavors. The 2020 Strategic Plan also highlights the challenges that hinder growth in this area. Significantly, Malta has a relatively low percentage of science and technology graduates and consequently a low percentage of qualified individuals in science and technology in the labor force, compared to other EU member states. This is corroborated by the latest Innovation Union Scoreboard, which identifies human resources as one of Malta's relative weaknesses. One reason for this is that local small and medium-sized businesses are geared toward the local market, and do not consider international opportunities; what's more, only 7% of local small businesses offer products that could be regarded as unique. Efforts are being made to respond to this situation through various programs, but the island's expansion of its capacity to innovate can only be very gradual. In 2013, the government budget allocated €32

million to R&D and innovation activities. Sectors to be supported included biotech, pharmaceuticals, health care, maritime activities, information technology and electronics. In the Innovation Union Scoreboard 2014, Malta was described as a moderate innovator, with a rank below that of the EU average.

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

Spain

Score 4

Spain has never been a leading example of research and technology policy, as evidenced by the relatively poor ranking of its universities, the reduced number of patents registered and other indicators of public or private support to innovation, which are far below other advanced economies. Although it is true that there has been an increase in the public spending devoted to innovation since the turn of the century, the crisis has hit this strategic field and the draconian cuts implemented in the last years have worsened the earlier situation – which was not brilliant, either. The last Eurostat figures show a deep decrease in investment in R&D, reaching only 1.24% GDP in 2013 (from a peak of 1.35% in 2009) while the European Union and OECD averages are above 2%. The Ministry of Science and Innovation actually disappeared in 2012 when it merged within the Ministry of Economy.

The government's pledge to promote a new model of economic growth based on brainpower rather than on construction after the bursting of the housing bubble has not been reflected in the budget. On the contrary, the national research council CSIC (the largest Spanish scientific institution with 6,000 scientists and more than a hundred institutes) signaled in 2013 that a "catastrophe" in its research centers may happen if no extra money was found. Its budget has fallen by 30% from 2008 levels, and it only offered 35 permanent positions in 2014, compared with 263 in 2008. The budget of the largest university (Universidad Complutense de Madrid) has also been reduced by 15% during the same period. Since 2012, the seven public research entities (including the CSIC) linked to the central government have been assigned a replacemt rate of only 10% of retired scientists. The same restriction applies to all public universities with more teaching obligations for professors, who, consequently, have less time devoted to research. At the regional level, the promotion of research has also suffered considerably, except in the cases of the Basque country and Andalusia, which show some progress regarding patents registered.

Many promising young researchers are going abroad because it is difficult to remain

competitive in a climate of such uncertainty with scarce resources. A rise in the median age of the scholarly workforce, the obsolescence of lab instruments and an excessive bureaucracy are other mitigating factors. As a consequence, citizens have become more aware of the relevance of R&D policies. According to the Cotec Report on Technology and Innovation, some positive signs regarding R&D investment were evident in 2014, largely thanks to European Commission funding and private investment (which represents 53% of total Spanish R&D spending).

Citation:
http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tsc00001&plugin=1

COTEC. 2014. Informe 2014 sobre Tecnología e Innovación en España. www.cotec.es/index.php/pagina/sala-de-prensa/notas-de-prensa/show/id/1033/titulo/cotec-presenta-su-informe-2014-sobre-tecnologia-e-innovacion-en-espana

http://sociedad.elpais.com/sociedad/2014/04/16/actualidad/1397672744_539094.html

Bulgaria

Score 3

Traditionally Bulgaria is 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 in the wake of the global economic slump from a high of 0.31% of GDP in 2009 to 0.22% of GDP in 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. Spending on R&I is substantially lower than in most other EU countries. Total R&I spending per inhabitant fell from 21% of the EU average in 2008 to 15% of the average in 2013. In 2013, according to the third European Company Survey of the European Foundation for the Improvement of Living and Working Conditions, only 23% of Croatian companies had introduced new processes or significantly changed old ones since the beginning of 2010, compared to 35% of companies in the European Union as a whole. 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 2012, Greece has never made research and development a priority policy sector. In fact, its levels of R&D funding (public and private) have remained very low by international comparison. This is a factor of overall economic activity, institutional weaknesses, and cultural resistance to public-private collaboration.

Most research is conducted at state universities and state research institutions. 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. The public provision of research funding on a stable, open and meritocratic basis, tied to national priorities, has proven very problematic and the crisis has created fresh problems. Funding for research institutions is often delayed, if not impeded, by bureaucratic friction and stasis. In October 2014, the government passed a bill in parliament which accorded larger decision-making powers to general managers of research institutions and rendered 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). This law was rejected by all opposition parties and the associations of researchers and university professors.

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.

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

Citation:
Data on expenditure on research and development and its evolution over time is drawn on Eurostat; see http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Gross_domestic_expenditure_on_R%26D,_2000-2010_(%25_share_of_GDP).png&

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. 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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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 economic oligopolization 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.

Romania

Score 3

Romania's expenditures on R&D are among the lowest in the EU, accounting for only 0.12% of GDP for business R&D and 0.3% for public R&D in 2013. As a result, Romania faces a crisis in the research sector characterized by a chronic shortage of active researchers (Romania had 2.09 researchers per 1,000 employees in 2012, compared to an EU average of 7.8). Resource scarcity has led to the massive migration of the most capable researchers to other sectors of the economy or other countries. At the same time, poor remuneration and uncertain prospects of professional advancement prevent the influx of young talent. Despite the Ponta government's promise that the 2013 and 2014 budgets would be development-oriented, there were no significant increases in the public R&D budget. However, one positive development was the increase in the tax deductibility of R&D investments from 20% to 50% in 2013. The National Council for Sciences and Technology Policy still lacks the executive ability to plan, prioritize and coordinate R&D in Romania.

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 the period under review, the situation has worsened further. The Fico government has made little progress with its plans to merge the Slovak Research and Development Agency (SRDA) and other minor research agencies into a single research agency, and to create a new technological agency tasked with financing industrial research. Moreover, the attempt to transform the Slovak Academy of

Science – traditionally the country's single most important research institution – into a public institution provoked a wave of protests by scientists, in large part because of the originally planned 17% cut in the body's budget. While the government withdrew a portion of the proposed cuts, uncertainty regarding the funding of grant programs has continued. Research and innovation policy was complicated by the fact that the minister of education, science, research and sports was replaced twice in 2014.

Slovenia

Score 3

Slovenia's R&D activities have long been of both low quality and quantity. The Bratušek government placed little emphasis on R&D, and failed to increase 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&D.

This country report is part of the Sustainable Governance Indicators 2015 project.

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