

**SGI** Sustainable Governance  
Indicators 2009

Sustainability  
**R&D report**



*Indicator*      **Research and innovation policy**

*Question*      **Do R&D policies support technological innovation and foster new product creation?**

*30 OECD 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 = Policies effectively support innovation and enhance productivity.*
- 8-6 = Policies largely support innovation and enhance productivity.*
- 5-3 = Policies partly support innovation and enhance productivity.*
- 2-1 = Policies have largely failed to support innovation or enhance productivity.*

## Sweden

*value 9*

Sweden ranks in first place when it comes to R&D spending among the OECD countries. Furthermore, for the past several decades, Sweden has ranked in the top three in terms of global R&D spending. The Swedish government believes that the long-term competitive advantage of the country's economy lies in knowledge-intensive, R&D-based products. For example, Sweden has a relatively large proportion of research intensive industries in the telecommunications, medical and transportation industries.

The current center-right government, which came into office in 2006, says it intends to pursue a R&D-oriented policy toward business and industry as a part of its policy of stimulating economic growth. At the same time, however, when compared with other countries, Sweden has little technical research capability. In fact, a comparison of the technical research performed by non-private enterprises in Sweden and Finland shows that Finland has a larger technical research volume than Sweden in absolute numbers despite the fact that Sweden's population is almost twice as large as Finland's.

Moreover, Sweden has some difficulties shepherding ideas on their way from research facilities to companies that will transform them into products and bring them onto the market. In the process, factors from other policy areas (e.g., tax policy) have reportedly led researchers not to pursue the commercial application of prototypes in Sweden but, rather, to seek patent rights in other EU countries or in the United States.

In addition, securing venture capital funding has also occasionally been a problem, forcing research facilities to approach venture capital banks from other countries in order to fund the final stages of development. In general, then, while Sweden's R&D policy proper seems to meet its objectives, the critical link between research and industry is somewhat more problematic.

## United States

*value 9*

Research and innovation policy in the United States is very supportive of technological innovation. The average annual growth rate of government R&D budgets was 7.4 percent during the period between 1995 and 2005, which was the fifth-highest among OECD countries behind Luxembourg, Spain, South Korea and Ireland. The U.S. government directly funded the National Science Foundation (NSF) with \$5.8 billion in both 2006 and 2007 as well as the National Aeronautics and Space Administration (NASA) with almost three times that amount each year. Much higher U.S. government funds flow into the financing of R&D through the Department of Defense's orders for the most modern and sophisticated military weapons. The U.S. government also grants comparatively high depreciation allowances and investment tax credits to businesses for their R&D expenses. It also has very generous tax rules when it comes to the large endowments of universities and research institutions, where a significant proportion of the R&D activity takes place. For example, the tax-exempt status of private universities, some of which number among America's top universities, can also be seen as constituting the U.S. government's indirect support for R&D.

After rapid growth between 2000 and 2005, the scientific-research budget of the National Science Foundation is expected to lose ground in relation to inflation between 2005 and 2010. In a similar way, the National Institutes of Health (NIH), which constitutes the principal source of funding for medical research, also lost approximately 10 percent of its real purchasing power between 2003 and 2006.

Annotation: Congressional Research Service, Science and Technology Policy: Issues for the 109th Congress. (Washington D.C., 2006).

## Denmark

*value 8*

For many years, Danish governments have endeavored to support technological innovation. This can be seen, for example, in the increased financial means provided to universities, the targeted support of the transfer of new knowledge to companies, support for entrepreneurship training programs, generous conditions for some industries (e.g., wind energy) and large-scale efforts to promote the implementation of information technology in the educational and administrative sectors.

Such initiatives have had varying levels of success. According to quantitative data (e.g., the level of R&D spending, the number of patents registered or the proportion of graduates in the sciences), Denmark ranks above-average for OECD countries. At the same time, however, it should be kept in mind that politics cannot always easily influence all parameters in this context. For example, over a period of many years, various governments have tried to raise the number of university students focusing their studies on technical or scientific subjects, but these efforts have been met with a high degree of inertia on the part of Danish students.

## Finland

*value 8*

Finland is a leader in terms of R&D spending, and has held this position for several years. The results have been quite impressive in terms of indicators such as science and technology degrees and triad patents (patents applied for in the United States, Europe, and Japan), although perhaps less so with regard to high-tech employment. Still, the reputation of Finland as a high-tech country is well earned. However, R&D inputs have focused on applied research to the disadvantage of basic research, and universities and other basic research institutes have not benefited much.

In the long run, the level of applied research being dependent on the level and achievements of basic research, this bias will no doubt have negative consequences for product development and productivity. Moreover, technology transfer from universities to industry is not functioning as well as it could, and academic entrepreneurship is relatively poorly developed. The number of high-tech start-ups is low by international comparison. Obviously, there are not enough incentives for young talented people to start their own businesses. The government has launched a national innovation strategy, seeking to enhance the environment for innovations and improve their competitiveness, input into national productivity and societal utility.

## Germany

*value 8*

Due to stagnating R&D expenditures in recent years, Germany's relative international position has weakened. Aware of the crucial role of innovation in the overall economy, the government developed a "High-Tech Strategy for Germany" in 2006. This involves all ministries relevant to research and development, and aims at enhancing the coordination between individual ministries' innovation policies. The strategy also encourages cooperation between industry and science, especially with regard to Germany's large public research establishments. Through 2009, the strategy will make €15 billion available to small and medium-sized enterprises working with cutting-edge technologies or performing research and innovation activities.

Germany's regulatory burden and taxation policies hamper innovation in small and medium-sized enterprises. Therefore, research and innovation should be promoted through tax breaks. Additionally, demographic change is seen as a major risk to future innovation, especially in conjunction with the education system's poor performance.

## Iceland

*value 8*

For political reasons, Icelandic policy-makers have a long history of granting farming and fishing special treatment. Thus, the government has implicitly penalized

manufacturing and services in ways that have hampered the rapid development of high-tech exports, innovation and the creation of new indigenous products.

Nevertheless, research and development have surged in recent years. Public and private spending on R&D in Iceland increased from 2 percent of GDP in 1998 to 3 percent in 2004, to one of the highest levels in the OECD. About 40 percent of this expenditure, or 1 percent of GDP, was provided by the government. Likewise, the number of researchers engaged in R&D per million people is, at 6800 in 2004, higher than anywhere else in the OECD except in Finland (which had a comparable rate of 7800). The rapid increase in R&D activity reflects the ongoing transformation of the Icelandic economy away from agriculture and fisheries to manufacturing and services, with the emergence of new private firms in biotechnology, pharmaceuticals, and some high-tech manufacturing, among other new sectors. A major government goal was to support research into the use of geothermal energy which could be (and now has been) exported. The government also supported the foundation of a biopharmaceutical company in Iceland, Decode, which is one of the world's leaders in its field.

However, high-tech exports still constitute only a small proportion of total merchandise exports – between 3 percent and 6 percent between 2001 and 2004, according to the World Bank. A jump in this ratio to 27 percent in 2005 seemed to reflect mostly the sale -- i.e., re-export -- of previously imported aircraft. Education is also a potential concern.

Tertiary school enrollment nearly doubled from 38 percent of each cohort in 1998 to 68 percent in 2004, with the opening of many new colleges attracting new and sometimes tuition-paying students who otherwise would not have gone to university. However, the country's tertiary school enrollment rate remains lower than that of several other OECD countries, which may be attributable to a comparatively low public expenditure on tertiary education (1.2 percent of GDP in 2003).

It is true that relatively more Icelanders attend foreign universities than is common in most other countries, and that these costs are not fully reflected in the figures cited above. Yet Iceland has a comparably young population, and thus could be expected to spend more, not less, on education at all levels, including tertiary education.

## Luxembourg

### *value 8*

Awareness of the need to increase public R&D spending and to create public research facilities has long been growing, but little was done before the beginning of the new millennium. However, the creation of the National Research Fund in 1999 and the establishment of the University of Luxembourg in 2003 helped change the country's direction. The amount of public money spent on research has more than quadrupled over the last decade, reaching about €110 million, or nearly 1 percent of GDP, in 2006. The government is eager to double this percentage by the end of the decade in order to meet the European Union's Lisbon Strategy goals.

Aware that fast growth without well-defined guidelines could lead to uncontrollable growth, the government recently demanded an evaluation from the OECD. The

report concluded that the bottom-up approach dominating Luxembourg's present R&D policy needs to be complemented by top-down elements clearly determining national goals for research and innovation.

Private research is in the hands of a few large corporations such as Arcelor Mittal, Goodyear, and Dupont de Nemours. It is estimated that about two-thirds of the money spent on R&D comes from the private sector.

## South Korea

*value 8*

South Korea's innovation performance is mixed in international comparison. The current level of research and development (R&D) spending ranks South Korea sixth among OECD member countries. Growth in public R&D spending and the share of science and technology degrees granted are both extraordinarily high.

Korea has secured a place in the middle ranks internationally in terms of high-tech employment and triadic patents (patents filed the key markets of the United States, Japan and Europe), although a large gap between Korea and the top countries remains. Still, this midfield position can be considered a huge success given that Korea only recently joined the OECD. Before the 1970s, Korea's heavy industry sector was tiny, and the country had no electronics or automobile industry to speak of until the 1980s. The shift from industrialization through learning and fast adaptation to original research and innovation is progressing slowly

In 2006, the government launched the "Brain Korea 21 Initiative," providing 20,000 graduate students and postgraduate researchers with scholarships. The goal is to improve the quality of graduate schools in Korea and establish 10 research-oriented universities by the year 2012. The government has also invested in high-tech broadband Internet infrastructure in order to facilitate information technology development. The Korean government is trying very hard to close the gap with the most advanced countries, and emancipate itself from the import of technology. However, these policies are not always effective. For example, an ambitious project to build 14 technology parks designed as academic and industrial research clusters turned out to be a waste of taxpayers' money.

## Switzerland

*value 8*

Switzerland has a modern and innovative research policy, which has helped increase productivity. The country ranks among the world's best in terms of number of citations, and is ranked top in the world with respect to the number of registered patents. The promotion of research and development using public funds is comparatively strong. In addition, businesses invest a large amount of money in research. There are relatively few bureaucratic hurdles hindering the promotion of research. However, the amount of cooperation between universities and industries could be increased. The involvement of small and medium-sized enterprises in

research projects could be improved through public-private partnerships, which would in turn increase the use of research findings by such enterprises.

## Australia

*value 7*

In the absence of a tradition of private sector involvement, government has traditionally played a major role in fostering research and innovation. There have been a series of broadly welcomed programs over the last decade aimed at strengthening research infrastructure and facilitating business innovation through tools such as R&D grants and venture capital or technology diffusion. Critics have pointed out, however, that these steps merely redress the decline in education spending in the 1990s.

Private sector R&D expenditures and outputs have meanwhile been consistently lower than desired. This reflects in part the relatively small magnitude of the incentives provided by the government. It may also partly be a function of the industrial structure of the Australian economy, which has comparatively little in the way of high-tech manufacturing industries.

## Austria

*value 7*

Since 2001, both total research-and-development (R&D) spending and the ratio of R&D expenditures to GDP in Austria have remained above the EU average. Companies are the most important contributors, accounting for 46 percent of Austria's R&D expenditures. So-called competence centers support the cooperation between private companies and academic research institutions.

Nevertheless, Austria's research-and-innovation policy suffers from structural deficits in human-resource investment. Public research institutions lack adequate funding and modern financing structures, which results in their having an insufficient pool of the most highly qualified employees. More generally, the average growth of public spending on R&D lies significantly below the OECD average, and the Austrian research sector is fragmented. Lacking a coherent technology concept, research-and-innovation policy falls within the purviews of three separate ministries (those of economics, education and transport). These overlapping purviews lead to coordination problems – and even rivalries.

## Canada

*value 7*

At 1.96 percent of GDP in 2005, Canada's R&D expenditures were above the OECD average, but it still only ranked fifth among the G-7 nations. Canada's main weakness is in business R&D intensity, which accounted for only 54 percent of its R&D as compared to the U.S. level of 70 percent in the same year. However, Canada

performs well for R&D intensity in higher education, ranking second in the OECD. This performance translates into strong outcomes for publications per capita (sixth in the OECD) and the quality of publications (fifth in the OECD). The weak performance in business R&D results partly from Canada's industrial composition: There is a disproportionate number of small firms and a high degree of foreign ownership, both of which tend to lead to lower R&D investment levels. While Canada's latest efforts at developing a research and innovation strategy are ambitious, the OECD points out that there is still considerable scope for enhancing the country's innovative capacity.

## Ireland

### *value 7*

Recent policy trends have been directed toward transforming Ireland into a country with a knowledge-based economy. The period under review witnessed significant increases in spending on both R&D and fourth-level education. In 2006, Ireland's R&D spending as a percent of GDP reached the OECD average after having previously lagged far behind this point. Nevertheless, spending in this area still remains relatively low when compared to market leaders, and the majority of innovation and expertise in technologically advanced sectors of the economy come from multinational companies rather than indigenous Irish enterprises.

There have, however, been some significant increases in funding. The National Development Plan (2007 – 2013), for example, has allocated €3.2 billion to scientific research. Over the same period, the Science Foundation Ireland (SFI) will invest up to €1.5 billion in academic research aimed at generating new knowledge and supporting cutting-edge technologies and competitive enterprises, especially in biotechnology and information and communications technology. At the same time, however, core funding of universities has declined in real terms, and the government has resisted calls by the sector for the reintroduction of third-level fees. The effectiveness of this strategy remains to be proven.

## Japan

### *value 7*

In terms of research and development input, Japan has been one of the leading countries of the world. Most of the R&D spending has been done by private industry, and was more concentrated in applied research than in basic research. It is particularly noteworthy that high and rising R&D spending has been maintained during the years of the economic slowdown. Since about a decade ago, the government has made it a top priority to reform its R&D system through a new so-called Basic Law, and through plans under this law, the third of which went into effect in 2006. Accordingly, growth in public R&D spending over the past decade has been considerable. However, the efficiency of these efforts has been unconvincing. The plans have boosted government funding for basic research;

promoted cooperation among universities, industry and other research establishments; aimed at making these institutions' work more effective; and have tried to internationalize the research landscape. Considerable funding has been allocated, but convincing reform has proved difficult to achieve.

In contrast to international perceptions, Japan's performance in educating scientists and science graduates has been mediocre by international comparison. Although Japan's performance in terms of triad patents (patents filed in Japan, the United States and Europe) is strong, the country will need to improve the education of a new generation of researchers who should be more open to novel ideas and methods, different from predecessors who followed careers characterized by seniority-based pay and path-oriented progress.

## Netherlands

### *value 7*

With respect to scientific productivity and technological output (i.e., the number of patents registered), the Netherlands scores relatively well. The majority of these patents come from the private sector, and the number deriving from public institutions is small and has seen recent decreases.

At 1.8 percent of GDP, however, R&D expenditure in the Netherlands is substandard and far below the Lisbon Strategy's objective of 3 percent of GDP. The deficiencies in R&D investment can be explained by the Dutch economy's transformation from a manufacturing economy characterized by intensive R&D to a service economy.

Nevertheless, R&D activities are high on the policy agenda, and there are a number of objectives the government believes it should meet in order to keep the Netherlands attractive as a place for R&D-intensive businesses, to attract new R&D-intensive companies, and to retain those already there. Current policy proposals include:

- nurturing a more active relationship between the Ministry of Economic Affairs and large and medium-sized companies in the Netherlands
- preserving "key areas" of R&D and innovation and continuing "hot spot" policies (i.e., programs on water technology, food and nutrition industries, creative industries, and automotive and maritime industries)
- improving investment conditions by paying more attention to the quality of the knowledge infrastructure, improving links between public and private research institutions, encouraging the transfer of knowledge between research establishments and industry, and securing the needed availability of qualified personnel.

An important part of this last policy involves encouraging research centers to conduct more product-related research. The government rewards universities involved in establishing start-up companies or cooperating with businesses. This policy aims to improve the competitive edge of companies by easing knowledge transfers from pure research environments to applied and productive sectors of the economy.

## New Zealand

*value 7*

New Zealand's research and innovation policy is clearly deficient according to indicators assessing research and development, high-technology employment and patents. The OECD has criticized the nation's approach to these issues, recommending a coherent policy that would increase enterprises' incentives to invest in R&D, and which would provide more guidance and funding to basic and applied research institutions.

The problem does not seem to result from bureaucratic hurdles, but rather from the country's small size and geographical isolation, and the small number of large firms operating at an international level. These factors will continue to hamper the country's success, despite its extraordinarily favorable business environment. The government reacted to this in 2006 with its "Economic Transformation Agenda (ETA)," which aims at increasing R&D in biotechnology, information and communication technology, design, and film production.

Foreign investors are perceived to hire innovative entrepreneurs away from New Zealand to larger markets, and there is little the government can do to stanch this flow. Moreover, many of New Zealand's major and most successful industries belong to the agricultural sector. By its nature, this sector is not particularly research intensive. New Zealand also struggles with a low level of labor productivity – according to the OECD, only 58.5 percent that of the United States in 2005 (measured on the basis of GDP per hour worked), compared to Australia's 83.6 percent, and an average of 75.9 percent across all OECD countries. Once again, the country's small market size plays an important role in this area.

## United Kingdom

*value 7*

The United Kingdom's innovation performance has been mediocre in international comparison. The current level of research and development intensity (R&D spending as percentage of GDP) ranks sixth among the G7 countries, with only Italy ranking lower. At the moment and despite a relatively strong academic science base, the share of researchers in total employment is relatively limited and employers regularly report shortages. In international comparison, the number of patents is relatively low as is that of true product innovators.

To address these problems, the government published in 2004 a 10-year plan for science and innovation that includes the target of raising R&D intensity from the current level of 1.9 percent to 2.5 percent of GDP by 2014. The plan sets out a comprehensive set of policies to improve the sustainability of the public science base, stimulate increased business investment in R&D, create incentives for knowledge transfer and university-business collaboration, improve the teaching and learning of science and engineering subjects at all levels, and achieve greater public engagement with science.

However, the United Kingdom's now far-advanced shift from an industrial to

service-based economy means that R&D spending may not be a fully sufficient indicator of innovation. Nontechnical innovation, for example in financial services, plays an important role in Britain's economic development. The city of London is known for the ease of access to loans and venture capital availability – features made possible by a specific market-oriented regulation regime. The United Kingdom also excels in the quality of its management schools and has several world-class universities that foster strong links with the business community in developing new products.

## Belgium

### *value 6*

Over the last two decades, research policy in Belgium has progressively been redistributed from the competence of bodies at the federal level to those at the regional and community levels. At the federal level, new strategic approaches have been developed to activate fiscal and parafiscal incentives to promote R&D efforts, such as partial tax exemptions in favor of employers who employ researchers in universities, research institutions and companies. The federal government also established the strategic think tank “High Level Group 3% Belgium,” which published a report outlining a global action plan to encourage more and better investments in research and business innovation in Belgium. The group suggested a number of concrete policy proposals, notably in the area of fiscal incentives. At the time of this writing, these changes had not yet been implemented.

On the regional level, Flanders has developed an R&D policy geared toward the promotion of entrepreneurship, high-tech development, a superior business infrastructure and the creation of innovative business clusters. The Flemish government uses fiscal instruments to encourage R&D and provides risk capital for innovative companies. It founded a new venture capital fund and offers fiscal advantages for individuals investing in new companies. Flanders has held the lead in Belgium in innovation for a long time.

To further the region's business research efforts, the Walloon government exploits public research in the economic sector and is working to improve the spread of technology in companies. With the region's “Marshall Plan” a reinforced approach to supporting innovative public-private partnerships in key sectors is emerging and R&D programs are being reinforced. Nevertheless, many enterprises complain that there are still considerable bureaucratic hurdles in the region.

## France

### *value 6*

Public funding of research and innovation policy has a significant role in France and explains why, in some areas, French industry is at the forefront of the high-tech sector. Internationally, research policy in France is comparatively weak; this is mainly due to the low level of investment by private industries in research and

development. The cooperation between industries and universities is also relatively poor, which helps to explain the small amount of patents registered in France. Deficits in France's research policy go hand-in-hand with its interventionist industrial policy, which has nurtured excellence in state-aided sectors (e.g., armament, aviation, space or transport) but resulted in broad neglect elsewhere.

## Hungary

*value 5*

Hungary has not paid sufficient attention to research and innovation policy in recent years. The nation's scientific capacity is still remarkable but underutilized and declining, because of the low attention paid to it and to the poor transfer of scientific achievements. Research and development spending has remained below 1 percent of GDP for a long time. While some multinationals have established research centers in Hungary, R&D spending has largely come from the government. The institutional system of research and innovation, which includes the Hungarian Academy of Sciences, is itself badly in need of innovation and renovation.

The Gyurcsány government has adopted a number of measures aimed at addressing these problems. Alongside a number of minor measures, it established the National Office for Research and Technology (NKTH), a new agency in charge of implementing the government's innovation and technology policy; it created the Research and Technology Innovation Fund, a new funding source financed by a levy on enterprises; and it presented an ambitious new midterm science, technology and innovation policy modeled on the EU's Lisbon Strategy. The results of these measures have yet to be seen. There are some concerns that they have further complicated the already complex R&D system.

## Norway

*value 5*

Despite its high GDP per capita, Norway spends relatively little on R&D, allocating a significantly lower share of GDP to research than do its Nordic neighbors (1.6 percent of GDP compared to 3.5 percent and 4 percent in Finland and Sweden, respectively). Research policy is non-pluralistic, government led and is not strongly oriented towards 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, and distributed through a single research council. Recent reforms have not been very successful and the government is frequently criticized for insufficient investment in research. This low aggregate investment level shows up in a relatively low number of patents granted. It is also interesting to note that the share of degrees granted in science and technology is low and that Norwegian children fared especially low in science knowledge in the OECD's recent 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. The council's selection of priorities has often been narrow, and informed by questionable criteria. There is thus ample scope for increasing investment in academic and basic research, as well for promoting more involvement by private and public actors.

## Portugal

### *value 5*

R&D in Portugal stands at one of the lowest levels in the European Union and reflects the economy's relatively low productivity level. This underperformance results in large part from the level of private R&D, which is one of the lowest in the European Union. Public R&D spending, on the other hand, does not lag far behind the EU average. Furthermore, the country's ongoing fiscal consolidation makes it more difficult to maintain a high level of growth in public funding for research. As a result, Portuguese firms do not introduce radical innovations, and the number of original patents is low.

At the same time, however, Portuguese businesses have demonstrated a relatively strong innovative performance in some areas related to the implementation of innovation (also known as "innovation diffusion"). To some extent, this reflects the very structure of the Portuguese economy, which is characterized by many low-technology and therefore low-skill small and medium-sized enterprises (SMEs). At the same time, however, it at least partially results from a policy framework characterized by relatively strong public R&D and relatively limited incentives for private R&D, as well as from the relative scarcity of quality human capital (i.e., a lowly qualified workforce).

The European Innovation Scoreboard's classifying of Portugal as "catching up" to an EU benchmark in technological terms clearly confirms the relative effectiveness of publicly funded R&D, a strength that should be built upon. Moreover, technological development has an EU dimension in Portugal via the Lisbon Strategy.

In general, the Ministry of Science is the only one that has not been hurt by budget cuts in the last two years, and continued investment is expected. Funding increases have been funneled to scientific research and not to the university system as a whole. However, there has been a significant increase in the financial resources directed, in particular, to the number of scholarships for graduate education, the employment of people holding doctoral degrees, R&D projects (with external evaluation by panels of foreign researchers), new laboratories and research facilities, consortia with foreign universities and support to technology-based business projects.

Nevertheless, there is still a great gap to be overcome. In 2005, Portugal only spent 0.81 percent of GDP on R&D, or less than half the EU-25 average. Moreover, about 60 percent of that expenditure was government-financed, which is 25 percentage points above the EU-25 average.

## Spain

### *value 5*

Both the private and public sector have weak innovation policies, as shown through the country's persistently weak productivity growth (0.6 percent of GDP per year from 1997 to 2006), a low number of patents and share of researchers employed, the limited spread of information and telecommunications technologies and a general lack of private-sector initiatives. The main factors that can explain this negative situation are the country's policies on innovation, education, competition and the workings of the labor market. R&D expenditures have been clearly lower than the OECD average, Spain lags significantly behind EU standards in technology and clearly is falling behind with regard to the Lisbon Agenda's 2010 objective to assign 3 percent of GDP to research and development efforts, with at least two-thirds coming from private investments. The working conditions of researchers are poor, with low salaries, small support staffs and are in general not valued highly within society. Qualitative standards at universities are often poor and staff insufficiently business-oriented. Although R&D-related subsidized loans were previously available for companies looking to invest, many firms were deterred from pursuing such loans by bureaucratic hurdles.

To improve the environment for innovation, the government has set up an ambitious project called the Ingenio 2010 plan, which aims to double funds for civilian research by 2010. Consequently, the budget for research and development rose by 27 percent in 2005 and by 32 percent in 2006. R&D policy has become a crucial part of the Spanish national reform program. Legislative reform also aims to eliminate red-tape with regard to R&D activities. While the very recent evolution in R&D has been positive, the key challenge that remains is the lack of private research; more attention to patents and biotechnology is also required.

## Czech Republic

### *value 4*

Research and innovation has gained a high profile in policy discussions, and a government committee oversees and provides advice on policy formation and implementation. Nevertheless, government spending has fluctuated from year to year as a result of constraints imposed by other priorities backed by more powerful lobbies (e.g., social and transportation policies). As a result, the targets set by the Lisbon Strategy have been missed. Nevertheless, spending on research and innovation as a percentage of GDP sets the Czech Republic comfortably above the bottom of the league. This reflects both government policies and the strategies of multinational motor-vehicle manufacturers that have located some development activities in the Czech Republic. Growth in public spending on research has generally kept pace with growth in GDP. However, the development of new, high-tech companies is low, owing less to bureaucratic barriers than to deficiencies in independent research output, financing and applicable business expertise.

## Italy

*value 4*

Aside from the relatively scarce resources involved (as a percentage of GDP, Italy spends significantly less on R&D than its European peers, 1.1 percent versus the EU-15 average of 1.9 percent), Italy's defunct research and innovation policy at the national level is visible in both the public and business sector. In the former, resources made available by the government are actually increasing, but funds tend to be earmarked mainly for specific sectoral projects rather than for structural projects that could have a potentially broader economic impact.

Furthermore, the lack of transparency and the high degree of discretion when it comes to allocating government funds among public research institutions needs to be pointed out. In this respect, meritocracy often is not at the top of the list. In the private sphere, Italy faces the problem of having on average many small firms, which lowers the attractiveness of investing in R&D for companies. A few incentives for companies to merge and gain "critical mass," together with (limited) tax breaks on R&D spending, haven't yet stimulated significant improvements. The relatively low number of patents in Italy also reflects this situation.

## Poland

*value 4*

Poland has suffered from low levels of public and private research and development expenditures and weak links between science and industry. Universities tend to be inflexible, and public-private partnerships are rare. The PiS government during its time in government launched a number of initiatives to tackle these issues. It promised a massive increase in public R&D spending and announced the creation of a national research and development center. Co-funded by the European Union, this center was geared to finance and coordinate research efforts and also to improve the networks among researchers and between researchers and industry. Financial support was earmarked to focus on several strategic fields, such as energy, biotechnology, new materials and production technologies. The effects of these measures on the country's innovative position remain to be seen.

## Slovakia

*value 4*

R&D in Slovakia has suffered from low public spending, weak industry-university cooperation, as well as weak cooperation between foreign and domestic enterprises. The Dzurinda government promised to increase public R&D spending from roughly 0.45 percent of GDP in 2004 to 0.6 percent of GDP in 2010. It created the Slovak Research and Development Agency and launched a number of programs aimed simultaneously at promoting qualified researchers and strengthening the cooperation

between universities and the business sector. The adopted reforms pointed in the right direction, but were not sufficient to overcome the existing problems. Since coming to power, the Fico government has reduced public R&D spending.

## Turkey

### *value 4*

Even though public resources allocated to science and technology have been significantly increased since 2005, the share of R&D expenditures with relation to the country's GDP is still lower than 1 percent. The number of full-time equivalent research personnel per 10,000 workers in Turkey was 13.6 in 2002, well below the OECD average of 66.6. Low public spending on R&D (0.6 percent of GDP in 2006) low private spending and poor cooperation between the private and public sector are at the heart of the problem.

In 73 firms that rank among the top 100 Turkish firms which spend the most on R&D, spending did not exceed 1 percent of the firms' net sales. Turkey's biggest company, according to research by the Istanbul Chamber of Commerce, ranks only 97 in absolute R&D expenses. A list of 1,000 companies outside of the European Union that spend the most on R&D includes only one Turkish business.

In addition, while 73.1 percent of researchers in Turkey work in higher education, 70 percent of researchers in developed countries are employed in the private sector. Companies in technology development zones are exempt from corporate and value-added tax until the end of 2013 and exemption from all kinds of taxes is also provided for researchers working in these zones. For companies that operate outside technology zones, 40 percent of R&D expenditures are deducted from income and corporate taxes.

## Mexico

### *value 3*

Mexico's research and innovation efforts have traditionally been poor. This is now improving, but from a low base. National spending on research and development in 2005 amounted to less than 0.5 percent of GDP, including both the private and public sector. This is quite low even by Latin American standards, let alone in the OECD. There have been improvements in many aspects, but resources have been insufficient. The main limitation has been the poor quality of secondary and higher education. This has constrained the number of people involved in these activities, and therefore undermined Mexico's ability to create new technologies and take advantage of a growing global demand for services.

The state agency responsible for research and development has pandered to the needs of large firms and not involved enough in helping small business. The problem is particularly acute since Mexican industry is deeply polarized by international standards, with a very large number of "micro" firms and a relatively small number of very large companies. The largest firms carry out some of their own R&D, while

also enjoying preferential access to state resources.

## Greece

### *value 2*

Greece's capacity for innovation is low. The state spends relatively little on research and development, and private-sector investment research is even lower. Bureaucratic impediments hamper research and innovation, and many of the country's start-up businesses (e.g., small shops or arts and crafts enterprises) do not use advanced technologies or belong to any technology-intensive sector. In 2005, Greece spent only 0.61 percent of its GDP on R&D, a small decrease compared to the peak year of 1999, when levels reached 0.67 percent of GDP.

Greece also faces persistent structural problems in this area. Private spending on research and development is only half of national spending (approximately 0.32 percent of GDP according to 2005 EU figures), while 21.6 percent of total research spending is attributable to foreign investment, largely from EU sources. Economic growth, which has been sustained over the last ten years, has been linked not to innovation, but to investment in construction and tourism and to the improvement of macroeconomic conditions after Greece's integration into the euro zone.

This report is part of the Sustainable Governance Indicators 2009 project, which assesses and compares the reform capacities of the OECD member states.

More on the SGI 2009 at [www.sgi-network.org](http://www.sgi-network.org)

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