

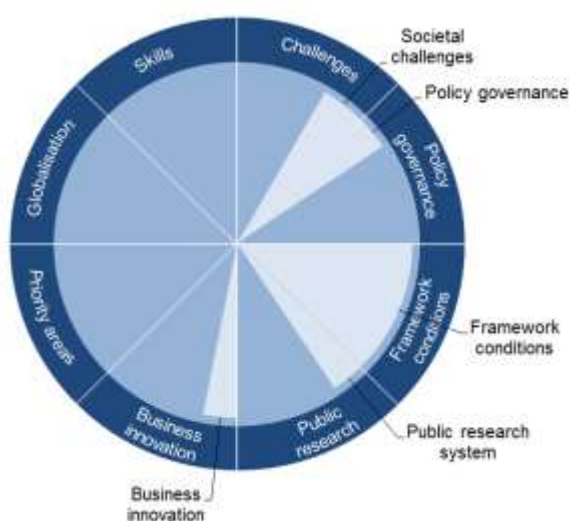
SWEDEN

Sweden has enjoyed strong economic growth in recent years. The present government aims to make growth more sustainable, inclusive and green, which will depend in part on Sweden's future research and innovation performance. The government's 2012 Research and Innovation Bill (for the period 2013-16) established a more selective, quality-based funding approach, and increased public expenditure on STI over this period by USD 445 million PPP (SEK 4 billion) – or by 15% compared to 2012- which followed a substantial increase of USD 625 million PPP (SEK 5 billion) during 2009–12. In connection to this target was set for GERD to reach 4% of GDP by 2020. The Bill for 2017–20 was published on November 28 2016, setting the orientation of research and innovation policy and the funding frame for the coming four years (2017-20) and with a perspective towards 2026. and with a perspective towards 2026.

Table 1. Gross domestic expenditure on R&D (GERD)

	SWE	OECD
GERD		
USD million PPP, 2014	13 883	1 181 495
As a % of total OECD, 2014	1.2	100
GERD intensity and growth		
As a % of GDP, 2014	3.16	2.38
(annual growth rate, 2009-14)	(+0.6)	(+2.3)
GERD publicly financed		
As a % of GDP, 2013	0.97	0.61
(annual growth rate, 2009-13)	(+3.4)	(+2.5)

Figure 1. Major STI policy priorities, 2016





Hot issues

Addressing social challenges (including inclusiveness)

Following the R&I bill of 2012, the Swedish Agency for Innovation Systems (VINNOVA), together with the Swedish Energy Agency and the Swedish Research Council Formas launched a key initiative in 2013, Strategic Innovation Areas (SIA), to enhance international competitiveness while finding sustainable solutions for social challenges through “systems innovation”. Implemented in parallel to SIA, the Vinnova’s Challenge Driven Innovation (CDI) programme addresses specific societal challenges, namely future healthcare, competitive industries, sustainable attractive cities, and information society. These two initiatives marked an important shift in policy orientation in Sweden, from focusing on supporting specific industries or sectors to catalysing a cross-sectoral and multi-disciplinary approach with long-term perspectives and funding towards societal challenges. Both programmes have received substantial increases in funding in the last few years: for example, funding for SIA increased to USD 145 million PPP (SEK 1.25 billion) for 2016, with around 50% expected from the private sector, up from USD 16.8 million PPP (SEK 145 million) in 2013, when the private sector contributed just 14% of funding. The Swedish Research Council supports fundamental research in all areas with a budget of some USD 750 million PPP (SEK 6,05 billion), medicine USD 27 million PPP (SEK 250 million), natural science and engineering USD 147 million PPP (SEK 315 million), social science and humanities USD 22 million PPP (SEK 200 million). The research council also funds strategic research in areas decided in dialogue with the government.

Encouraging business innovation and innovative entrepreneurship

BERD is relatively high, at 2.31% of GDP (5^d), though the intensity of business expenditures on R&D is substantially lower than the levels seen 10-15 years ago. Industry R&D is concentrated in large firms, which dominate the Swedish economy (6). VINNOVA has recently gathered all of its grant support schemes for innovation in SMEs, including its Research&Grow programme, into a new umbrella programme, Innovation Projects in Companies. The programme is targeted at the early development of high-risk companies working on a novelty in the industry with international potential. VINNOVA has also launched a pilot innovation vouchers scheme targeting SMEs.

Strengthening the public research system

Public expenditure on R&D is high (5^a). Much of this goes to research at Swedish universities, which are well placed in global rankings of world-class universities and publications (5^{b,c}). HERD, at 0.92% of GDP in 2014, is among the highest in the OECD area. Around 45% of funding for research in Swedish universities comes through institutional block grant funding, with the remainder earned through project funding. The allocation of block grant funding continues to be debated in Sweden and has recently undergone some reform. Since 2014, around 20% is allocated on the basis of performance in attracting project funding and in publications, up from 10% since 2009. From 2018 allocation will be based on three criteria, performance in attracting project funding, publications, and cooperation with companies and society. The aim is to incentivise both research excellence and relevance by rewarding publications, external project funding, and the use and impact of research and business contacts.

Improving the framework conditions for innovation

Improving the framework conditions for innovation is a key theme of the 2012 Research and Innovation Bill, followed by the 2016 Research Bill, the guiding frameworks for Swedish STI policy. This has for instance been the introduction of a modest R&D tax relief scheme, which provides a 10% reduction in the employers’ social security contributions for employees engaged in R&D. As the maximum total reduction is USD 26 000 PPP (SEK 230 000) a month, the tax relief primarily benefits smaller firms. The government has also sought to reform public venture capital so that it becomes less risk averse and focuses more on early-stage investments, where there are often shortfalls in private venture capital provision. A proposal tabled to the Swedish Parliament in 2016 proposes to incorporate the two existing public venture capital companies (Inlandsinnovation AB and Fouriertransform AB) into a new public company with a larger financial base and

without predefined sectoral and regional investment foci. Its model will be fund-of-funds, i.e. co-investing with private capital funds, to provide early-stage capital to Swedish firms with high-growth potential.

Improving the governance of the innovation system and policy

The Ministry of Education and Research and the Ministry of Enterprise and Innovation are chiefly responsible for research and innovation policy. In addition to adopting a Research and Innovation Bill every four years, a bill with a ten-year bill perspective was submitted to Parliament in November 2016 and will be adopted in 2017, to enhance the longer term perspective in research and innovation policy. A National Innovation Council, chaired by the Prime Minister, was created in 2014 to identify innovation policy challenges and to recommend solutions.

Some key STI performance indicators

Figure 2. Economic performance

Labour productivity, GDP per hour worked, index 2005=100

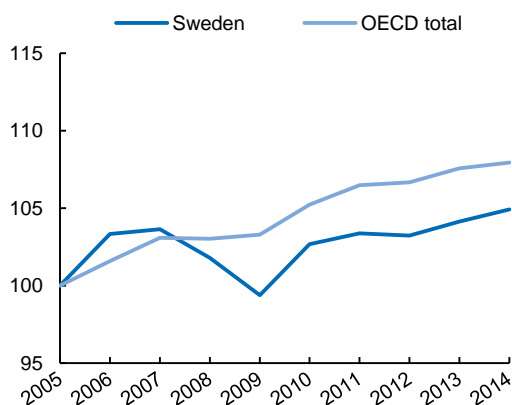


Figure 3. Environmental performance

Green productivity, GDP per unit of CO2 emitted, index 2005=100

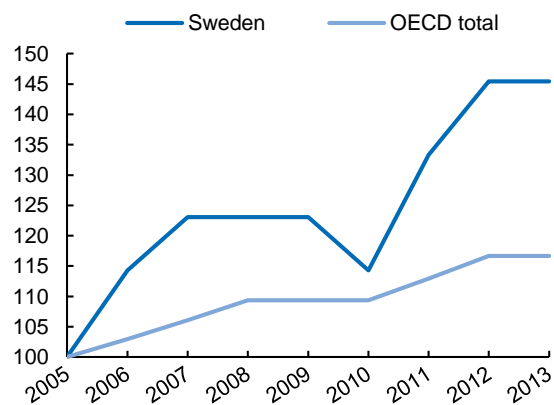
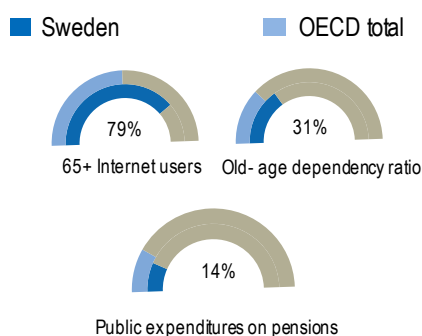


Figure 4. Ageing

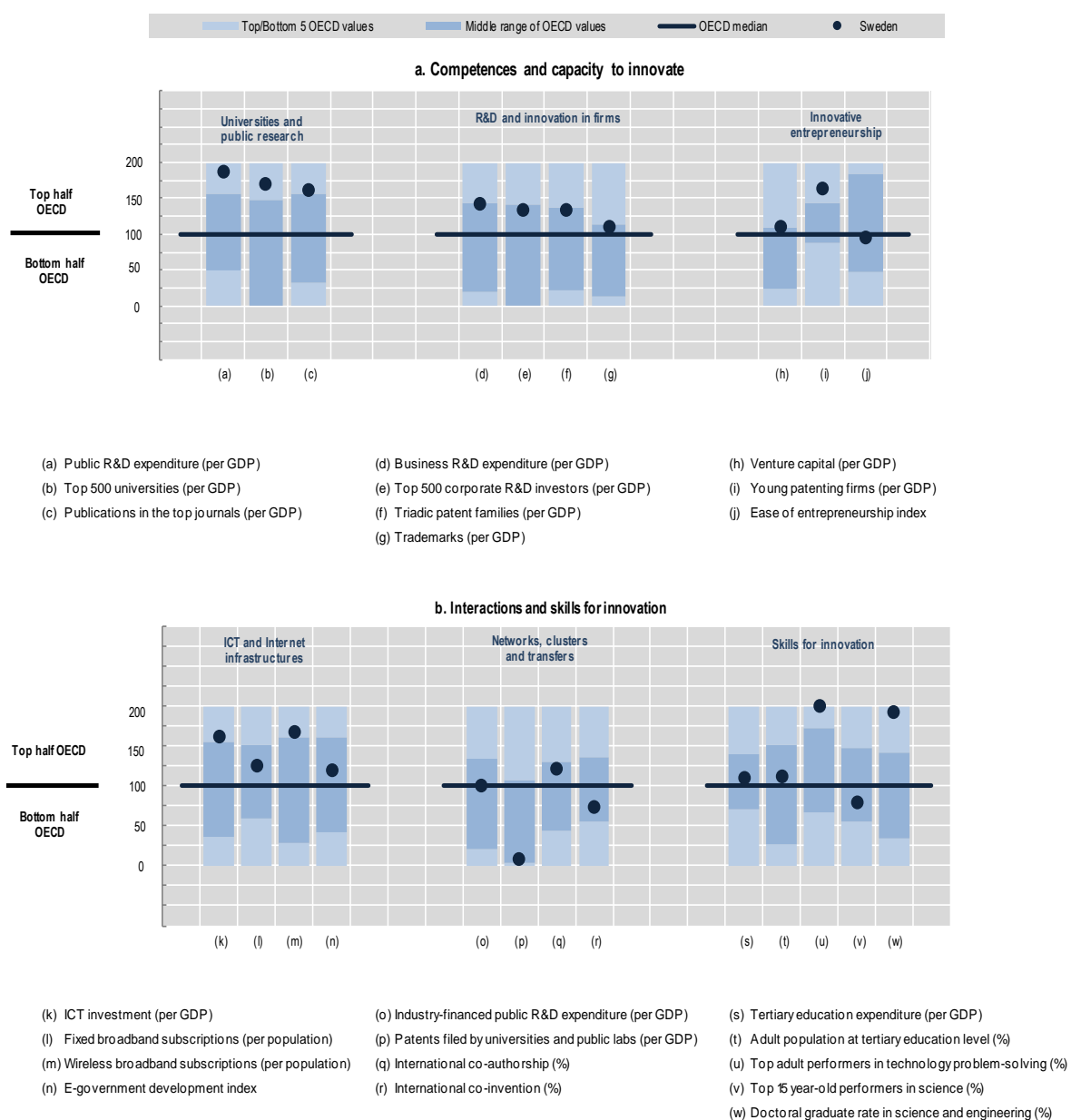
2015 or latest year available
Percentage



Benchmarking national STI systems

Figure 5. Science and Innovation in Sweden

Comparative performance of national science and innovation systems, 2016



Note: Normalised index of performance relative to the median values in the OECD area (Index median=100).



Highlights of the Swedish STI system

New sources of growth

As part of its Innovation Capacity in the Public Sector initiative, VINNOVA has since 2011 sought to support public procurers by funding competence development, support systems, networks, etc., for pre-commercial innovative procurement. Since 2015, the National Agency for Public Procurement has assumed the main responsibility for practical support for public procurement, including innovative procurement. It is partnering with VINNOVA to encourage agencies and municipalities to identify and specify their strategic development needs and targets, which may eventually lead to innovative procurement.

ICT and Internet infrastructures

ICT infrastructures are strong (Panel 1^{k,l}) and Sweden's e-government development index is above the OECD median (5ⁿ). The programme ICT for Everyone – A Digital Agenda for Sweden, adopted in 2011, sets an ICT policy goal for Sweden to become the world's leading economy in exploiting the opportunities of digitisation. Information Society 3.0 is one of the four challenges within VINNOVA's CDI Programme. In terms of research infrastructures, preparations for the construction of the European Spallation Source (ESS) have been under way in Lund, as has been the construction of the Max IV facility for a new-generation synchrotron radiation light source.

Technology transfer and commercialisation

Closer collaboration between industry and academia is an integral part of the SIA and CDI programmes. Furthermore, other VINNOVA programmes targeting “innovation milieus” (such as VINNVAXT and the VINN Excellence Centres), as well as thematic programmes, aim to support mission-oriented, pre-competitive collaboration between R&D providers and industry. Several schemes continue to support centres of excellence at universities, which seek to create excellent academic research environments in which industry participates actively. The low number of patents filed by universities (5ⁿ) is due to the “professor's privilege” which entitles researchers (instead of institutions) to patent their inventions. The public research institutes, which were grouped into a single holding entity (known as RISE – the Research Institutes of Sweden Holding AB) in 2009, have received further government funding and gone through a major restructuring since 2014 in order to achieve a consolidated and internationally competitive sector. RISE's purpose is to serve as a knowledge partner for businesses, as an intermediary between academia and industry, and as a nexus for participation in EU R&D projects.

Skills for innovation

Sweden's share of doctorate graduates in science and engineering and adults' ability to solve technical problems top the OECD countries (5^{w,u}). However, 15-year-olds' performance in science is below the OECD median although an increased performance was reported for 2015 as compared to 2012 (5^v). Accordingly, new measures are being introduced in 2016 to increase the salaries of teachers, to recruit more PhDs as teachers, and to introduce a new grading system for students as well as a one-year diploma programme to train teachers to address the shortfall of qualified STEM teachers in Sweden. In the new school curriculum, the teaching of entrepreneurship is mandatory. Skill development is integral in most of VINNOVA's schemes. A specific on-going initiative in support of skill development is the Mobility for Growth Programme (2012-2018), which supports career development of experienced researchers through international and inter-sectoral mobility. To attract overseas talent, the tax exemption rules for foreign experts and highly qualified personnel have been simplified, allowing those with remuneration above a ceiling value to be exempt from certain parts of income tax.

Structural aspects and specialisation

Figure 6. Structural composition of BERD, 2013 or latest year available

As a % of total BERD or sub-parts of BERD

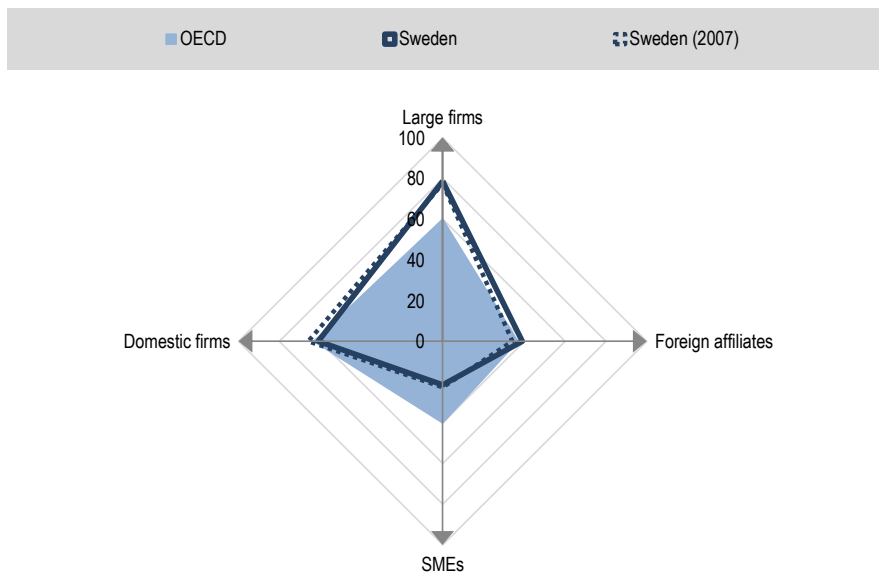
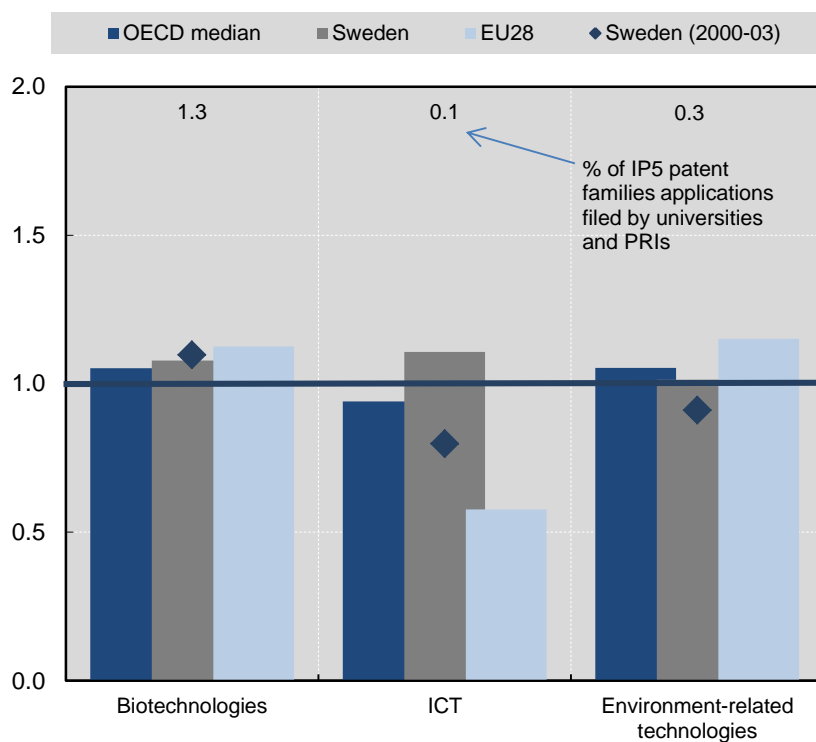


Figure 7. Revealed technology advantage in selected fields, 2011-13

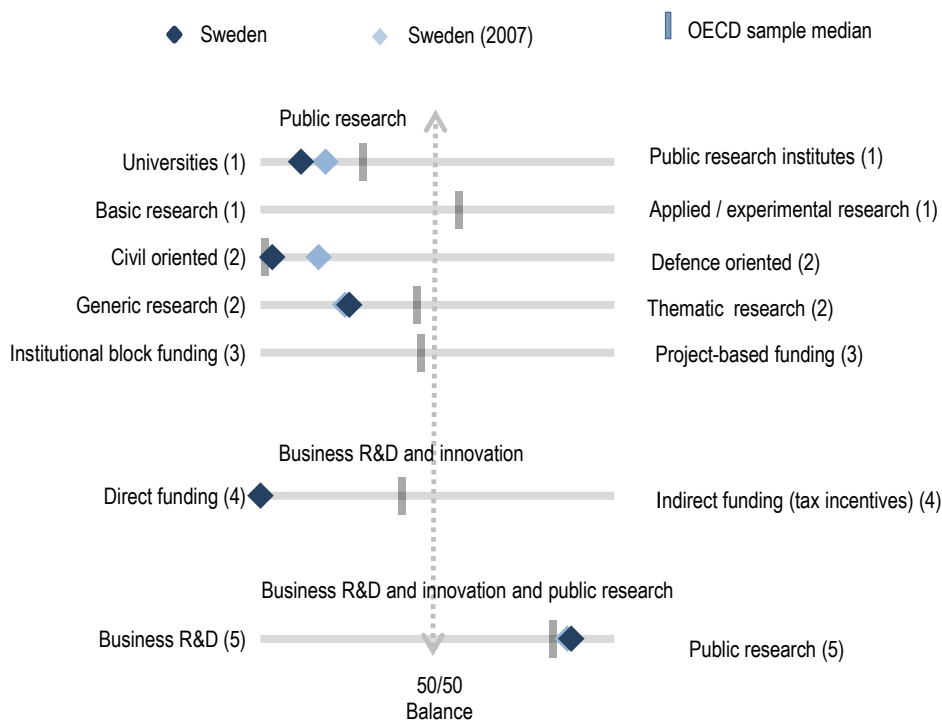
Index based on IP5 patent families applications



National STI policy mix

Figure 8. Allocation of public funds to R&D, 2014 or latest year available

By sector, type of R&D and mode of funding



(1). Balance as a share of both higher education (HERD) and government (GOVERD) R&D expenditure.

(2) Balance as a share of total government budget appropriations and outlays for R&D (GBAORD).

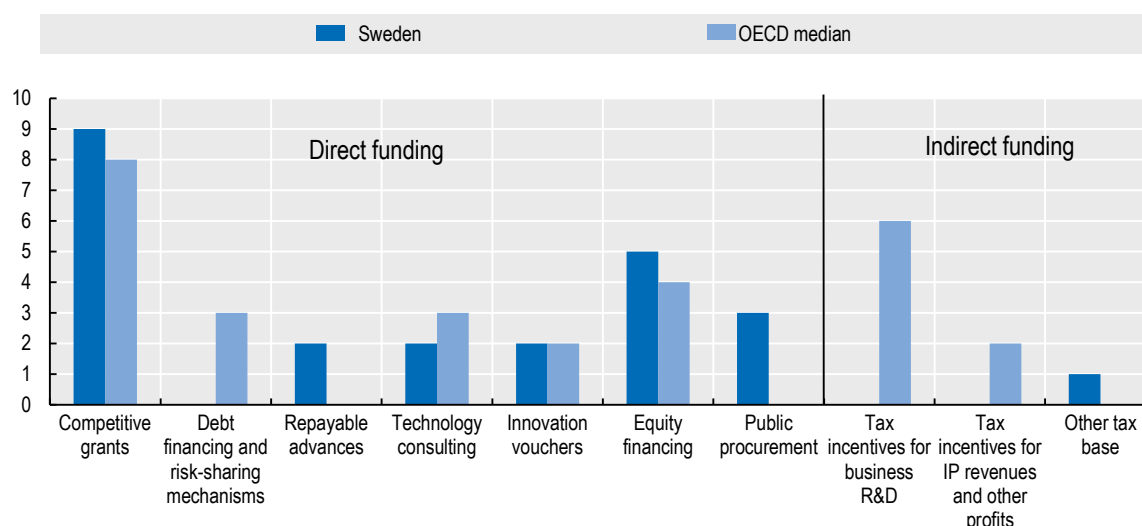
(3) Balance as a share of total funding to national performers.

(4) Balance as a share of both indirect funding (through R&D tax incentives) and direct funding (through grants, procurement, loans, etc.).

(5) Balance as a share of publicly-funded HERD and GOVERD and components of (4).

Figure 9. Most relevant policy instruments of funding for business R&D, 2016

Country self-assessment, index (9 = high and increasing relevance to 0 = not used)



Note: Policy information comes from country responses to the EC/OECD International Survey on STI Policies (STIP) 2016 and 2014. Sweden's responses are available in the EC/OECD International Database on STI Policies, edition 2016 at http://qdd.oecd.org/DATA/STIPSurvey/SWE...STIO_2016.

Source: See the reader's guide and methodological annex.

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