GERMANY

Hot STI issues

- Maintaining a lead in eco-innovation, addressing demographic change and ageing.
- Further improving access to funding for start-ups and innovative SMEs, fostering innovation in services.
- Improving the policy mix, including through a combined system of direct support and tax incentives.

General features of the STI system: Germany has the EU's largest innovation system. It supports an export-oriented economy with a thick layer of internationally competitive firms, notably in manufacturing. Germany represents 9% of OECD-area GERD, 8% of scientific publications, and 12% of triadic patent families. In 2011, BERD was 1.92% of GDP, well above the OECD average (Panel 1[(d)]). It is leveraged by strong links between industry and science, with a comparatively high proportion of public research funded by industry (1[(o)]). The relative number of patents filed by universities and public labs is on a par with the OECD median (1[(p)]), and industry patenting is strong. In terms of RTA, Germany is not specialised in ICTs and emerging technologies but has strengthened in the latter (Panel 2). While it has lost some of its RTA in environment-related technologies, it remains very strong. Only 27% of the adult population is tertiary-qualified (1[(s)]), but 37% of persons employed are in S&T occupations (1[(v)]). It has 8.1 researchers per thousand total employment, close to the OECD median. Researchers are well integrated in international networks: 47% of scientific articles and 17% of PCT patent applications are produced with international collaboration (1[(q)(r)]). ICT infrastructures are well developed with 33 fixed broadband and 29 wireless suscribers per 100 inhabitants (1[(k)(l)]). The e-government readiness index is slightly above the OECD median (1[(n)]).

Recent changes in STI expenditures: GERD was 2.82% of GDP in 2010, and has been growing by 3.7% a year for the past five years. It is targeted to be 3% of GDP by 2015. In 2009 industry funded 66% of GERD, government funded 30% and 4% was funded from abroad. Public funding in particular has grown over the past five years. The federal government and states (Länders) target spending 10% of GDP on education and research by 2015.

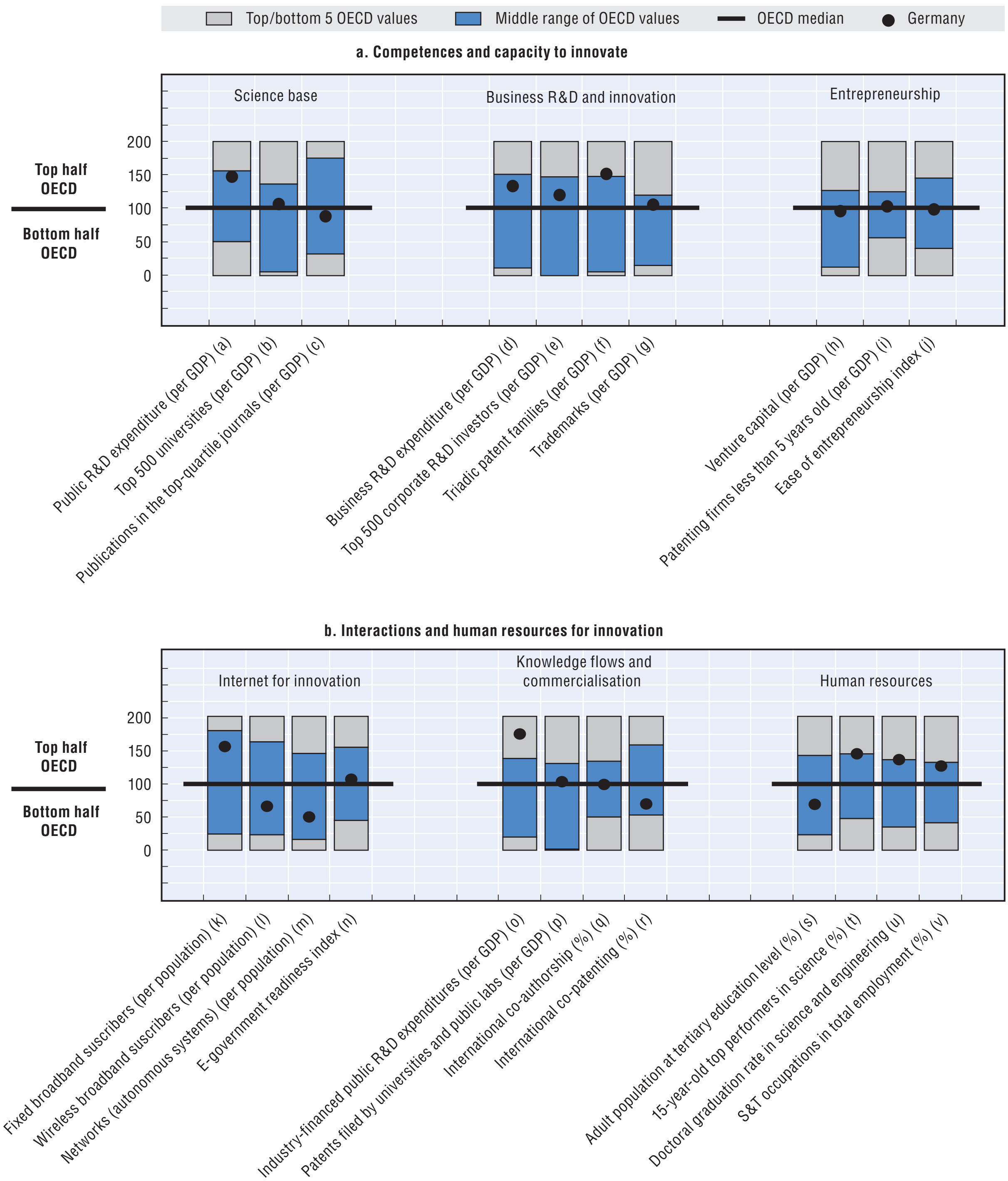
Overall STI strategy: Overall policy priorities have not fundamentally changed. The new High-Tech Strategy 2020 has identified five societal and global challenges: climate, nutrition/health, mobility/transport, security, and communication. Individual technology fields are intended to contribute to major social policy aims or to drive innovation in key technology areas. The Strategy aims to create lead markets and identified wide-ranging "forward-looking projects" over the next 10-15 years that will affect society. The Higher Education Pact, the Initiative for Excellence and the *Academic Freedom Act* are complementary. Key policy priorities are to keep pace with global trends, fund private and public R&D, reform the education system, and improve industry-science links. New policy measures include Validation of Innovation Potentials of Scientific Research, Go Innovative and Research Campus, a scheme that funds complex technologies with potentially radical impact.

Key figures

Labour productivity, GDP per hour worked in USD, 2010	**53.6**	**GERD, as % of GDP, 2010**	**2.82**
(annual growth rate, 2005-10)	(+0.8)	(annual growth rate, 2005-10)	(+3.7)
Environmental productivity, GDP per unit of CO_2 emitted in USD, 2009	**3.94**	**GERD publicly financed, as % of GDP, 2009**	**0.84**
(annual growth rate, 2005-09)	(+2.9)	(annual growth rate, 2005-09)	(+4.9)

Figure 10.16. **Science and innovation in Germany**

Panel 1. Comparative performance of national science and innovation systems, 2011



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

STI policy governance: STI governance has also been stable in recent years. Both the federal government and the states are important players. The Federal Ministry of Education and Research (BMBF) directs public and private R&D activities towards targeted fields of technology. The Federal Ministry of Economics and Technology (BMWi), and the KfW Banking Group have innovation programmes. The states fund universities and R&D linkages programmes.

Science base: Germany has a strong science base, with high public-sector spending on research, highly rated universities and research publication outputs (1[(a)(b)(c)]). GOVERD has increased by 4.7% a year in constant prices between 2005 and 2010, despite the recession and fiscal consolidation. Recent efforts to strengthen the science base include increases of up to 20% in the funding mechanisms for university research by both the German Research Foundation (DFG) and BMBF. The 2010 Pact for Research and Innovation is a joint effort of the government and the states to increase R&D funding to the Fraunhofer Society, the Helmholtz Association, the German Research Laboratories, the Leibnitz Association, the Max-Planck Society and the German Research Foundation from 3% to 5% a year.

Business R&D and innovation: Germany does not spend a high proportion of GDP on subsidies for R&D, and relies on direct support rather than tax incentives. It provides support to innovation in various ways.

Entrepreneurship: Limited access to finance for start-ups and SME innovation projects is an obstacle to innovation. The Central Innovation Programme for SMEs (ZIM) is a support measure open to all technologies and sectors. Its budget was increased by USD 1.1 billion for 2010-11 and it was voted the best innovation promotion measure in 2011. Venture capital (VC) access is being improved through tax relief for holding companies that invest in young technology companies. The High-Tech Gründerfonds invests in VC, as does the High-tech Startup Fund, ERP Startup Fund and EXIST, an entrepreneurship grant to universities.

Knowledge flows and commercialisation: Germany performs well in terms of knowledge flows and commercialisation. Initiatives to further improve collaboration between business and science are the Leading Edge Cluster Competition (with a budget of USD 1.5 billion), Excellence Clusters, Research Campus and Research Bonus; the German Centres for Health Research Initiative aims to improve laboratory-to-clinic knowledge transfer. The Strategy for the Internationalisation of Science and Research is meant to help German companies enter into partnerships with the world's most innovative centres. The EUROSTARS and Research in Germany programmes foster international links. The *Act on Better Enforcement of Intellectual Property Rights* and SIGNO protect and commercialise innovative ideas.

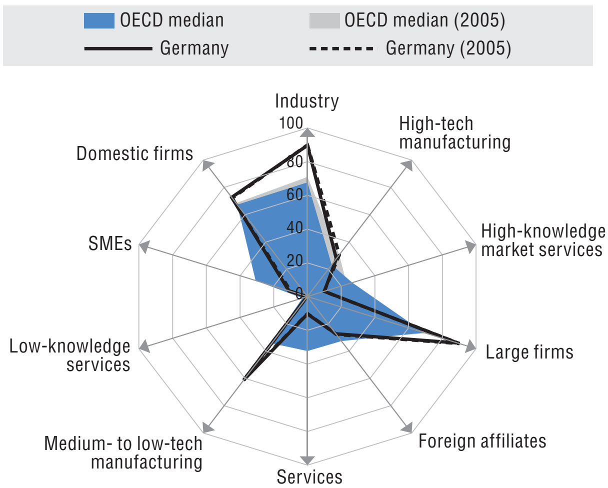
Human resources: A lack of skilled personnel is perceived as an emerging constraint. MINToring, School Curricula and Education Chains are programmes designed to improve secondary schooling, increase tertiary attainment rates and avoid a lack of expertise in maths, information technology, natural sciences and technology. The Quality of Teaching Pact has a budget of USD 2.5 billion to improve the quality of teaching from 2011 to 2020.

Emerging technologies: Technological competences need to be maintained and extended. The Initiative for Excellence promotes cutting-edge research at universities. Programmes such as Leading Edge Cluster and Innovation Alliances focus on breakthrough technologies. The 2012 BMBF Foresight Process will emphasise seven new fields, including production/consumption 2.0, life sciences, demography and sustainable energy solutions. Other areas include the Action Plan Nanotechnology 2015 and USD 1.5 billion a year for civil space programmes.

Green innovation: Green innovation remains a major German strength. The Framework Programme Research for Sustainable Development (FONA) (2010-15) was launched in 2010 and focuses among others on climate, energy and sustainable resource management. The CLIENT project helps to establish international partnerships in environmental and climate protection technologies and to trigger the development of lead markets.

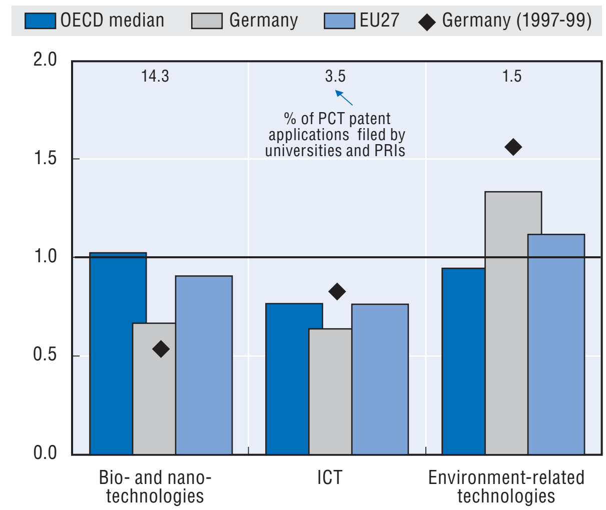
Panel 2. Structural composition of BERD, 2009

As a % of total BERD

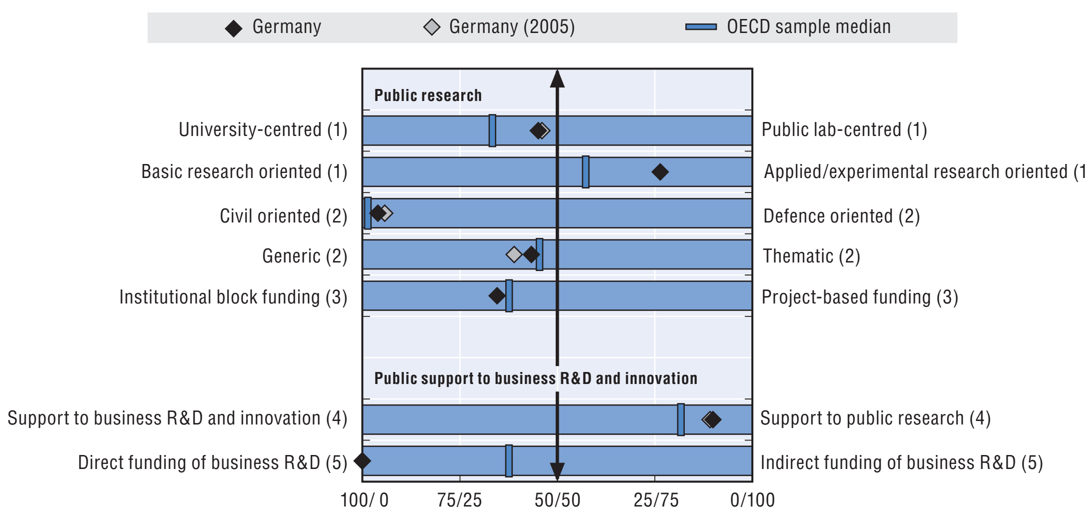


Panel 3. Revealed technology advantage in selected fields, 2007-09

Index based on PCT patent applications



Panel 4. Overview of national innovation policy mix, 2010



1. Balance as a percentage of the sum of HERD and GOVERD.
2. Balance as a percentage of total GBAORD.
3. Balance as a percentage of total funding to national performers.
4. Balance as a percentage of the sum of HERD and GOVERD funded by government and higher education and components of (5).
5. Balance as a percentage of the sum of indirect funding of business R&D and innovation through R&D tax incentives and direct funding of BERD through grants, contracts and loans.

Source: See reader's guide and methodological annex.

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