JAPAN

Hot STI issues

- Reconstructing and revitalising economic and social infrastructure destroyed by the Great East Japan Earthquake.
- Improving the return on R&D activities to respond better to the needs of Japanese society.
- Improve governmental co-ordination.

General features of the STI system: Japan is the third largest economy in terms of GDP after the United States and China. It has experienced a persistent economic slowdown since the 1990s and its growth prospects are threatened by an ageing population, fiscal pressures on social security spending, high national debt (over 180% of GDP), and the impact of recent crises and natural disasters. Japan's STI system is dominated by major corporate groups that rank among the world's largest corporate R&D investors (Panel 1[(e)]). Japan's business sector accounts for 77% of total GERD and is one of the most R&D-intensive (2.49% of GDP in 2010) in the OECD area (1[(d)]). The main R&D performers are essentially in high-technology and medium-high-technology manufacturing: TV and communication equipment (17% of BERD), motors vehicles (16%), and pharmaceuticals (10%) (Panel 2). The participation of small and young enterprises in national R&D efforts and output is relatively limited (1[(i)]). Innovation by large Japanese firms relies less on contracted public research (1[(o)]) and international collaboration (1[(q)(r)]) than on open innovation within the corporate group. Triadic patent output (as a share of GDP) is the highest in the OECD area (1[(f)]). Japan accounts for 32% of OECD triadic patents but only 14% of OECD GERD. It has a strong and growing RTA in environment-related technologies and ICTs (Panel 3). It has widespread ICT infrastructures, especially wireless broadband access (1[(l)]), and a sound skills foundation. The share of the adult population with tertiary education (44%) is well above the EU average (26%) and slightly above the United States (41%) (1[(s)]). At 17% of top performers in science in the PISA Japan ranks third in the OECD area after Finland and New Zealand (1[(t)]). However, there are few doctoral graduates in science and engineering (1[(u)]) owing to low participation of youth (especially women) in doctoral programmes and low enrolments in science and engineering studies.

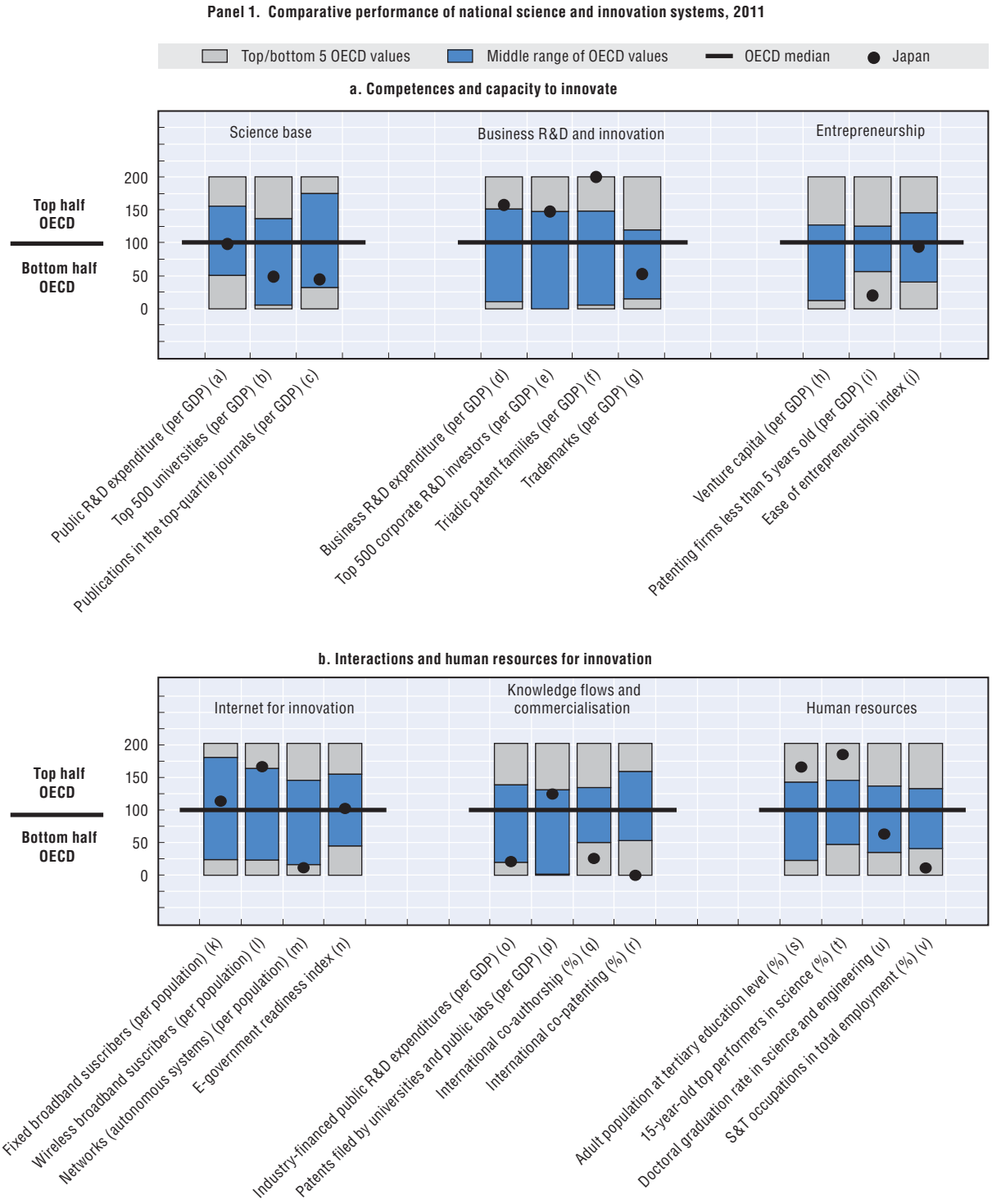
Recent changes in STI expenditures: Japan's GERD was 3.26% of GDP in 2010 (USD 141 billion), well above OECD and EU levels, and at the level of the most R&D-intensive countries (Sweden, Denmark, Korea). However, it stagnated in real terms between 2005 and 2010 owing to a sharp decline in business spending during the crisis which the USD 8.6 billion allocated by the government to S&T as part of the recovery plan did not offset. In spite of severe budgetary stringency, S&T budgets have been preserved. Certain budgetary lines have even been enlarged (energy, green technologies, science).

Overall STI strategy: The New Growth Strategy (2010) set an objective for GERD at 4% of GDP by 2020 and introduced substantial changes in STI policy to shift from a discipline-oriented to an issue-driven approach. Promoting green innovation and promoting life innovation have been identified as strategic priorities in the Fourth Science and Technology Basic Plan (2011-15). Restoration and reconstruction after the Great East Japan Earthquake which devastated northeast Honshu Island in 2011, at a cost estimated at at least USD 210 billion, is now a third pillar of national S&T policy.

Key figures

Labour productivity, GDP per hour worked in USD, 2010	**39.4**	**GERD, as % of GDP, 2010**	**3.26**
(annual growth rate, 2005-10)	(+0.9)	(annual growth rate, 2005-10)	(+0.0)
Environmental productivity, GDP per unit of CO_2 emitted in USD, 2009	**3.74**	**GERD publicly financed, as % of GDP, 2010**	**0.74**
(annual growth rate, 2005-09)	(+2.3)	(annual growth rate, 2005-10)	(+0.0)

Figure 10.25. **Science and innovation in Japan**



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

STI policy governance: The Reform of Independent Administrative Organisations, including public research institutions and research funding agencies, aims to reduce their number and to reform their governance structure.

Science base: Japan's public research system is strongly oriented towards applied and experimental R&D (70% of public expenditures) and relies on public labs (41%) (Panel 4). There are few Japanese universities of global stature (1[(b)]) and few articles by Japanese researchers in the top scientific journals (1[(c)]). This is well below what might be expected given public spending (0.71% of GDP) and quite moderate at the OECD level (1[(a)]). The 2012 S&T Budget increases funding for basic research to support future economic growth.

Business R&D and innovation: Public financial support to the business sector is limited as firms self-finance 98% of their R&D activities. Tax incentives are the main funding instrument, but direct funding has increased in relative terms since 2005. In 2009 grants, loans and contracts accounted for an estimated 35% of public support to business R&D (Panel 4).

Clusters and regional policies: The empowerment of regions is one of the most important issues in Japan, especially for recently devastated areas. In 2011, a new strategic regional innovation support programme was launched for regional revitalisation through knowledge transfer between universities and industry. It capitalised on prior cluster initiatives such as the Knowledge Cluster Initiative which ended in 2010. The Reconstruction Agency is also contributing to invigorate local industry.

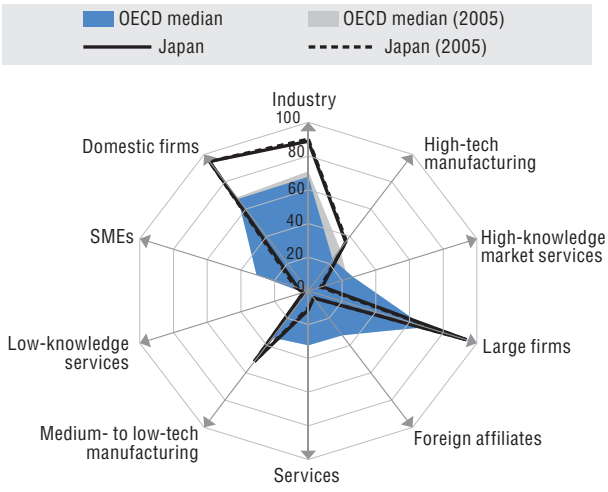
Knowledge flows and commercialisation: The commercialisation of scientific research has been a priority of Japanese STI policy in recent decades as reflected in the number of measures since the mid-1990s to foster technology transfer from academia to industry. For example, the A-step programme (Adaptable and Seamless Technology Transfer Programme through Target-Driven R&D) defines overall objectives to facilitate medium- and long-term collaboration on R&D and combines several funding programmes to enable technological development at various stages of commercialisation. The New Growth Strategy also encourages the use of intellectual property rights. In a context of increasingly open innovation, a new patent licensing and patent co-ownership system will be in force in 2012.

Globalisation: The New Growth Strategy has set an objective of doubling the flow of people, goods and money to Japan within ten years. Today, with Korea, it has the lowest share of GERD funded by abroad in the OECD area (0.4%). In 2010, the Inward Investment Promotion Programme suggested accelerating FDI through a cut in the corporate tax rate and deregulation of investment procedures. It also includes a broader series of initiatives to attract R&D facilities and global companies' regional Asian headquarters to Japan. Incentives, such as tax treatment and subsidies, are also to be developed under the corporate certification system.

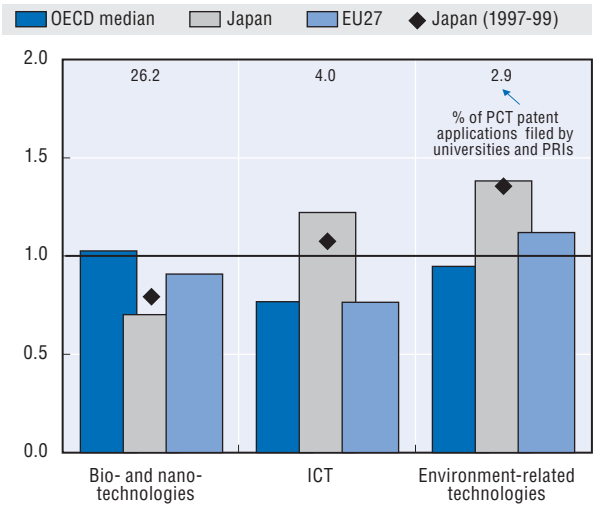
Human resources: The government has invested in lifelong learning by improving the facilities of the Open University of Japan, by promoting specialised college education training, and by reinforcing the qualification and equivalency framework. A national forum on the lifelong learning network has been held to address social challenges through lifelong learning activities.

Green innovation: Green innovation is a high priority for Japan. A Comprehensive Green Innovation Strategy was announced to develop environmental and energy technologies. It aims to create over USD 468 billion of new demand and 1.4 million jobs in the environment sector by 2020, and to reduce greenhouse gas emissions by 25% relative to 1990 using Japanese private-sector technology. After the Great East Japan Earthquake in 2011, the Japanese government decided to draw up a Green Growth Strategy (tentative name) in 2012.

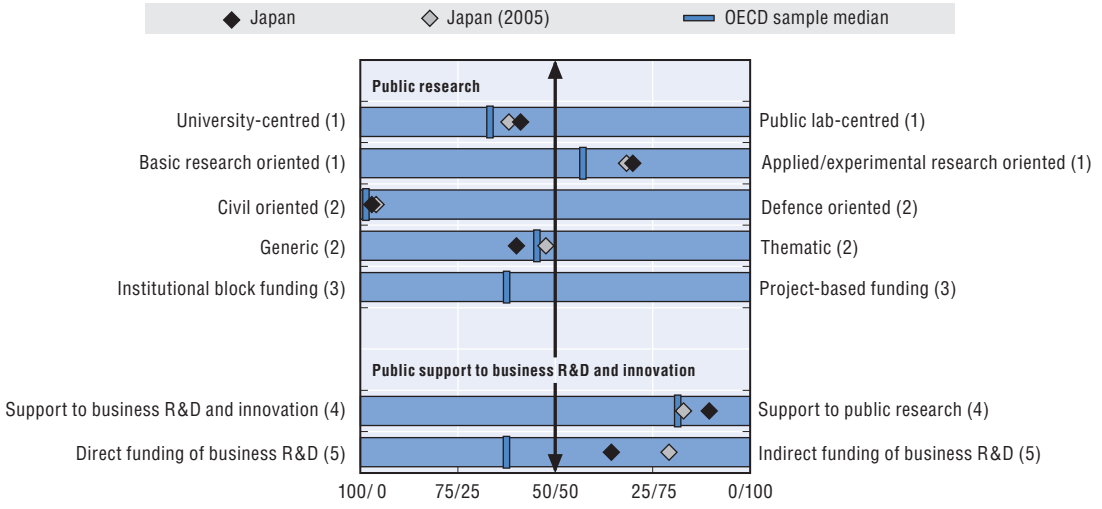
Panel 2. Structural composition of BERD, 2009
As a % of total BERD



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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