CHINA

Hot STI issues

- Promoting indigenous innovation capability, especially among Chinese firms.
- Fostering scientific excellence and world-class talent for STI.
- Innovating for green growth and addressing social challenges.

General features of the STI system: China is the world's second largest economy in terms of GDP but its GDP per capita is USD 8 350 (PPP). The STI system has moved from a Soviet-type science-based R&D system to a firm-centred market-based innovation system. While China's "open door" policy has helped it to access foreign capital and technologies, create pockets of knowledge-intensive activities and move up global value chains, it has also increased its reliance on foreign technologies. The national innovation system features marked regional disparities. Beijing has a strong science base, with many PRIs, including the Chinese Academy of Sciences (CAS), and top universities; these are national R&D centres with global connections. Shanghai has a large-scale, R&D-intensive industry base. Guangdong province has a foreign (manufacturing) firm-based innovation system and accounts for more than half of China's PCT patent applications (almost two-thirds in ICT). In contrast, China's western regions lack the absorptive capacity needed to capture knowledge flows from coastal areas and abroad. Collaboration, as shown in patent data, is weak across regions. China's R&D output in terms of patents is low (Panel 1[f]) although Chinese firms are active both as R&D performers and contractors (1[d][o]). The business sector accounts for 72% of GERD (1.30% of GDP). Business funds 11% of academic research (0.06% of GDP). China's RTA has increased in ICT over the past decade but lost considerable ground in biotechnology and green technologies (Panel 3). Innovative entrepreneurial activities (1[i]) appear constrained by regulatory and administrative burdens (1[j]). The dominance of state-owned enterprises, especially in public facilities, tends to reduce pressures to innovate. China's ICT infrastructures have developed fast but, in per capita terms, ICT use and e-government readiness are still low compared to the OECD median (1[k][m][n]). While China had the world's largest pool of FTE researchers in 2007, its workforce's tertiary education attainment is low (1[s]). This is changing quickly, as the tertiary attainment rate is twice as high for those aged 25-34 as for the 55-64 age group.

Recent changes in STI expenditures: China's GERD has more than doubled in just five years (2005-10) to USD 179 billion. Since 2009, China has the world's second largest R&D expenditure after the United States. GERD reached 1.77% of GDP in 2010. BERD as a share of GERD increased to the top level of OECD countries (Panel 2), and firm self-funded R&D reached 93%.

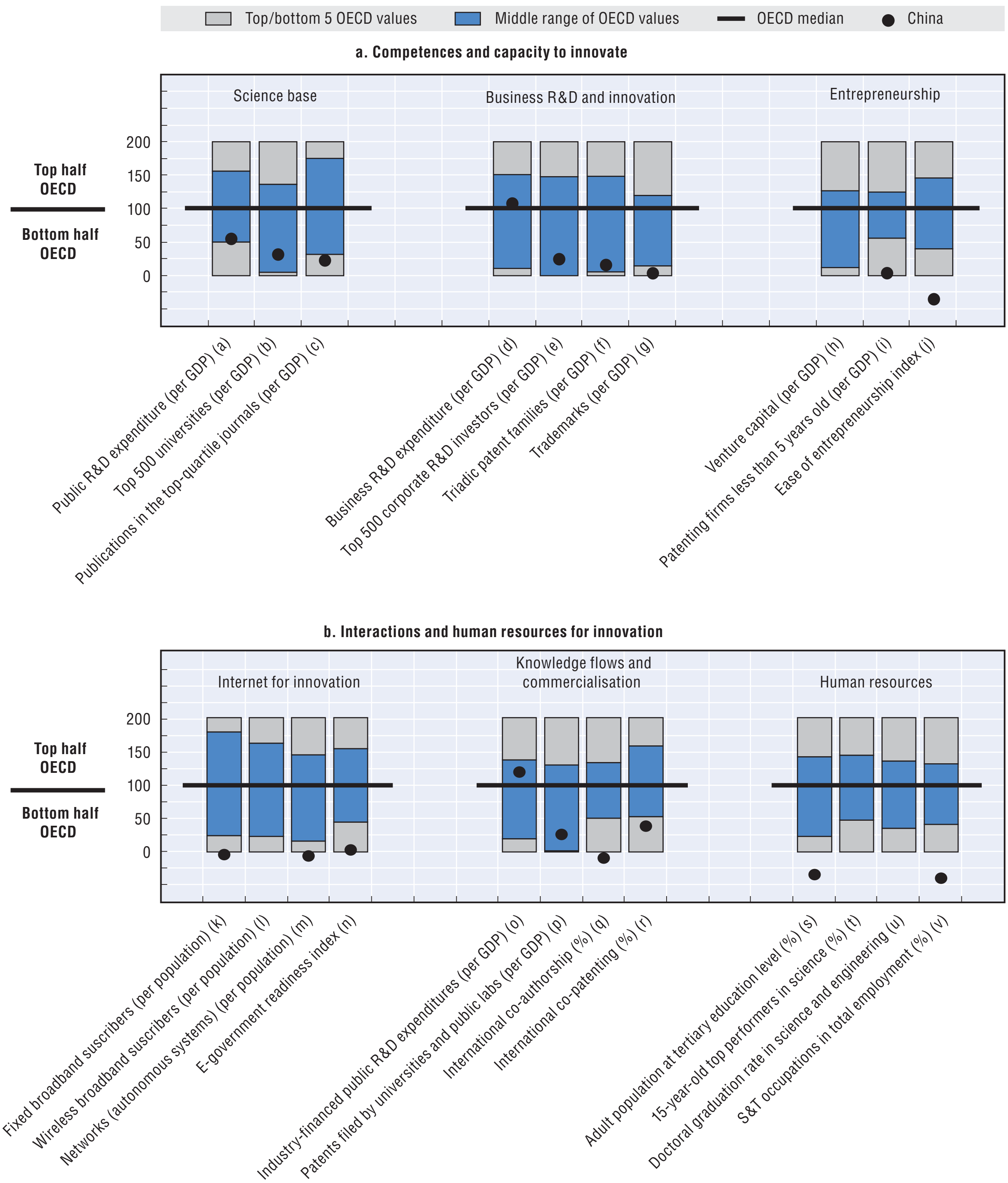
Overall STI strategy: The Medium- and Long-term Plan for S&T Development 2006-20 (MLP) provides a blueprint for China's transformation to an innovation-driven economy by 2020. R&D expenditures are meant to reach 2.5% of GDP. The present 12th Five-Year-Plan for S&T Development (2011-15) plays a central role in implementing the MLP and emphasises key technologies for strategic and emerging industries (manufacturing, agriculture, ICT), relieving the pressures on energy, resources and the environment, and accommodating

Key figures

Labour productivity, GDP per hour worked in USD, 2010	**n.a.**	**GERD, as % of GDP, 2010**	**1.77**
(annual growth rate, 2005-10)	n.a.	(annual growth rate, 2005-10)	(+17.9)
Environmental productivity, GDP per unit of CO_2 emitted in USD, 2009	**1.32**	**GERD publicly financed, as % of GDP, 2010**	**0.43**
(annual growth rate, 2005-09)	(+3.5)	(annual growth rate, 2005-10)	(+15.7)

Figure 10.8. **Science and innovation in China**

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).

the needs of an ageing population (pharmaceuticals, medical equipment).

STI governance: China's STI governance features strong central government leadership in setting strategic directions, objectives and policy frameworks. Provincial governments can adapt the national STI strategy to regional conditions for implementation.

Science base: Public research is strongly oriented towards applied and experimental R&D (82.9% of public R&D expenditure) (Panel 4). In spite of a major reform that converted many PRIs to enterprises in the early 2000s, PRIs still dominate public research (68.2%). In 2010, the CAS launched Innovation 2020, an extension of the Knowledge Innovation Programme, designed to improve CAS's R&D capability and contribution to innovation by setting up a series of research centres in space, IT, energy and health sciences, as well as science parks in Beijing, Shanghai and Guangdong.

Business R&D and innovation: The government has adopted various policy instruments to foster enterprise-centred innovation emphasising indigenous innovation capacity. While direct public support to business R&D is limited (4.3% of BERD in 2009), new tax incentives promote China's technological development. Since 2010, firms have access to a new R&D tax credit, and investments in R&D equipment can benefit from accelerated depreciation.

Entrepreneurship: The corporate tax and the value-added tax (VAT) have been significantly reduced for high-technology enterprises, SMEs and ICT firms in order to support development and technology transfer in software industries. New regulations allowing foreign investors to purchase local currency for investment in private equity partnerships were adopted in early 2011, and the central government appropriated USD 25 billion to strengthen credit guarantees and support the expansion of domestic demand.

Clusters and regional policies: China has a tradition of special economic and high-technology zones. Recent policy initiatives aim to strengthen linkages among them. In 2008, USD 393 million was earmarked, under the stimulus plan, to strengthen transport infrastructures, in particular to accelerate the construction of a high-speed railway network between Beijing, Shanghai and the Pearl River Delta. The Framework for Development and Reform Planning for the Pearl River Delta Region (2008-20) has been adopted to make the region an innovative centre in the Asia-Pacific area.

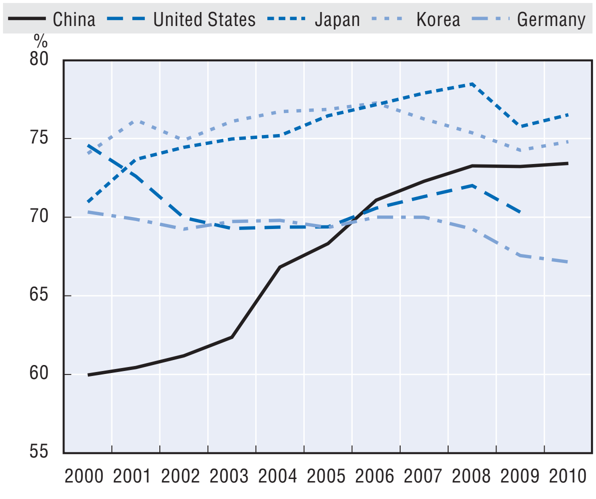
Knowledge flows and commercialisation: Attention has been given to strengthening the regulatory framework for IPR protection and to facilitate the transfer and commercialisation of knowledge. A new National Intellectual Property Strategy, adopted in 2008, aims to achieve a relatively high level of producing, utilising, protecting and managing IP by 2020. A special fund was set up in 2009 to support international patenting, national interim provisions for intellectual property management of major projects were adopted in 2010, and an IP Protection Action Plan was launched in 2011.

Human resources: The Medium- and Long-term National Plan for Science and Technology Talent Development (2010-20) was adopted to promote highly skilled mobility, to implement innovative platforms for S&T talent, and to establish national research centres for high-level R&D personnel. Living allowances and funding for postdoctoral research in enterprises are provided as well. Firms that invest in education and training programmes are granted tax incentives.

Green innovation: In 2009, the Ten Cities and Thousands Lightening Project aimed to promote the application of semiconductor lighting technology in 37 cities. In the same year, a demonstration programme involving 1 000 energy-saving or new-energy vehicles in 25 cities was launched to turn the automotive market towards new-energy vehicles and to have 500 000 of these vehicles in the market by 2015. The 12th Five-Year-Plan (FYP) has also devoted considerable attention to energy and climate change (*e.g.* gradual establishment of a carbon trade market) and has triggered a new wave of industrial policies in support of clean energy industries and related technologies.

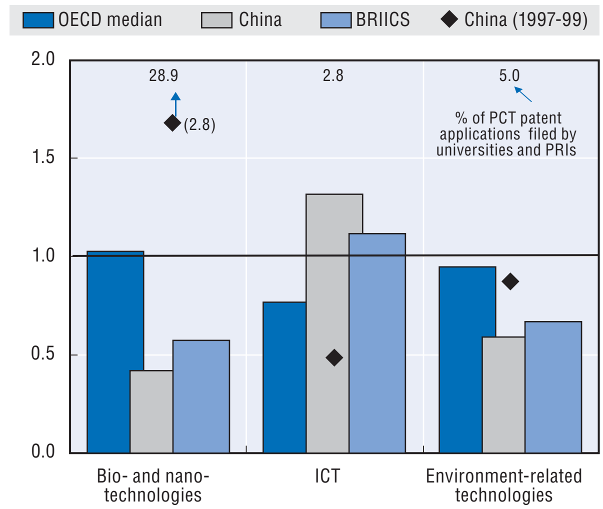
Panel 2. Share of R&D performed by the business sector, top 5 world performers, 2000-10

As a % of total GERD

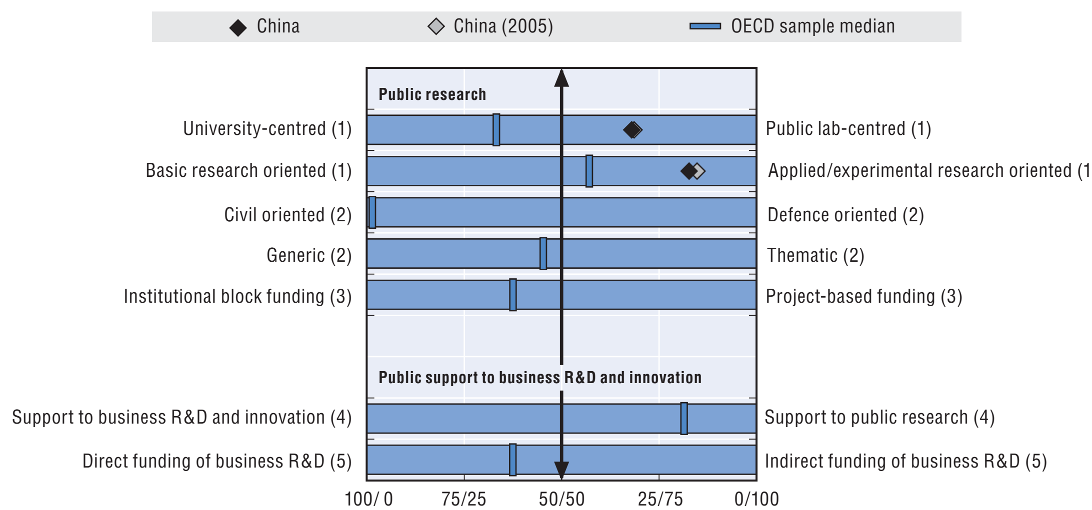


Panel 3. Revealed technology advantage in selected fields, 2007-09

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: OECD, Main Science and Technology Indicators (MSTI) Database, June 2012; see reader's guide and methodological annex.

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