MEXICO

Hot STI issues

- Investing in human resources at all levels.
- Consolidating technology transfer from public research to business.
- Improving conditions for innovative entrepreneurship, including financial markets.

General features of the STI system: Over the past two decades, Mexico has undertaken major reforms to liberalise its economy and improve its macroeconomic management. In spite of recent efforts to improve the performance of the national innovation system, major weaknesses remain. By almost all performance indicators Mexico lags significantly behind the OECD median, and for several it lies at the bottom of the scale (Panel 1). After a sharp decline from the turn of the century, the share of the federal S&T budget in GDP increased slowly from 2008 to reach its level of 2000 in 2010. Both public and business R&D expenditures are low as a proportion of GDP (at 0.25% and 0.18%, respectively, in 2009). In constant prices and as a share of GDP, R&D performed by the business sector decreased between 2006 and 2009 and was concentrated in large enterprises in medium-high- to low-technology manufacturing (Panel 2) and to a lesser extent, according to the latest innovation survey, in innovative SMEs. Recent measures targeting business R&D and innovation have not fully succeeded in curbing Mexican firms' preference for imported technologies over the development of domestic capacity. In spite of reforms to remove legal and regulatory obstacles to the creation of enterprises, innovative companies are slow to develop. Among OECD countries, Mexico has one of the lowest scientific and innovation outcomes (as measured by number of scientific publications and triadic patents per GDP). Very few patents were filed by universities and PRIs over 2005-09 ($1^{(p)}$). Although recent policy measures have encouraged industry-science linkages, PRIs' R&D expenditures financed by industry remain very low.

Recent changes in STI expenditures: In 2007, Mexico's GERD accounted for only 0.37% of GDP, the smallest share among OECD countries. As of 2008 GERD increased both in real terms and as a proportion of GDP to 0.44% in 2009. However, the major share of the increase came from government; the share of the business sector decreased from 44.6% in 2007 to 38.7% in 2009.

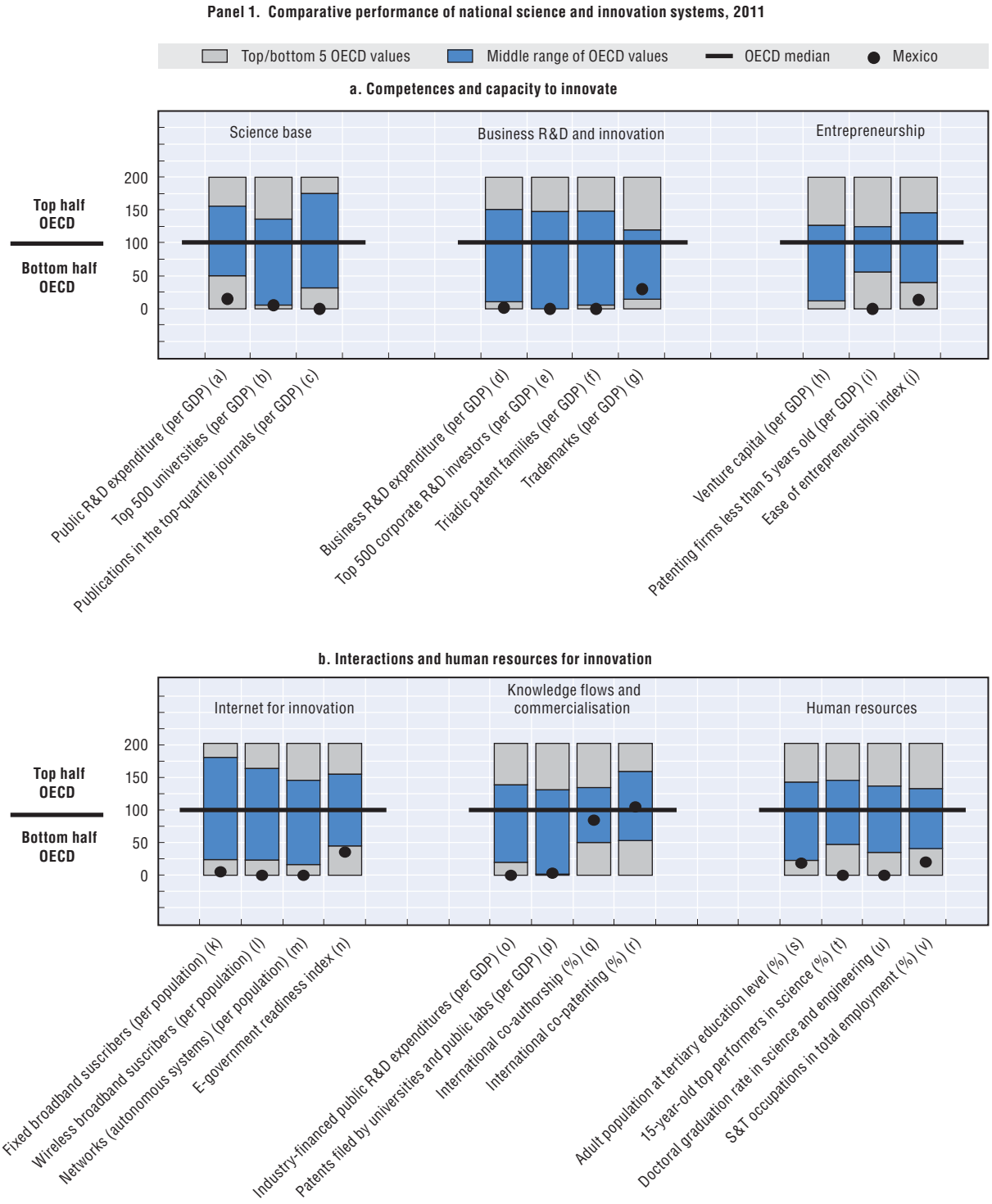
Overall STI strategy: The 2008-12 Special Programme for Science, Technology and Innovation (PECiTI) has an ambitious set of objectives, among which a greater focus on innovation by enterprises and in particular by SMEs, consolidation of the research and innovation capacities of the PRI and HEI sectors, including human resource development and links with the business sector, sustained efforts to improve S&T infrastructures and greater decentralisation of S&T and innovation activities.

STI policy governance: The 2009 amendment to the *National Law of Science and Technology* resulted in some changes in governance, such as the creation of the Intersectoral Committee for Innovation to develop a comprehensive approach to innovation through greater inter-ministerial co-ordination. Improved policy evaluation instruments were set up, and in 2010 the Committee Specialised in Science,

Key figures

Labour productivity, GDP per hour worked in USD, 2010	**19.8**	**GERD, as % of GDP, 2009**	**0.44**
(annual growth rate, 2005-10)	(+0.4)	(annual growth rate, 2005-07)	(–1.2)
Environmental productivity, GDP per unit of CO_2 emitted in USD, 2009	**3.87**	**GERD publicly financed, as % of GDP, 2007**	**0.20**
(annual growth rate, 2005-09)	(+0.0)	(annual growth rate, 2005-07)	(–4.0)

Figure 10.28. **Science and innovation in Mexico**



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

Technology and Innovation Statistics was established to improve STI information and encourage its use for policy design.

Science base: In Mexico the bulk of scientific output comes from a few strong HEIs and PRIs. While performance in terms of internationally refereed publications has improved slightly in the last ten years it remains low by OECD standards in terms of output per unit of R&D expenditure and much lower as a proportion of GDP. The National Researcher System (SNI), which provides monetary incentives for publication performance, has contributed to the increase in scientific output. Policies in support of the development of technology transfer offices (TTOs) in HEIs and PRIs are beginning to have a positive effect on science/industry linkages.

Business R&D and innovation: The share of the business sector in total R&D performance rose significantly from 2000 to 2006 but then declined from 0.49% to 0.42% in 2010. Despite various support measures to boost business R&D investment, the overall results have proved disappointing in terms of increased expenditure and innovative outputs as measured by patent applications. In 2009, the OECD highlighted an innovation policy mix unbalanced in favour of indirect support and a multiplicity of poorly endowed programmes. This has recently changed: the tax incentive was eliminated in 2009, and public funding to the business sector is now direct and competitive. A new R&D and innovation stimulus package was introduced in 2009 with a strong emphasis on SMEs and links with research institutes. New innovation programmes financed by the Ministry of Economy have been introduced.

ICT and scientific infrastructures: Since 2000 the government has significantly increased its investments in S&T infrastructures. Also, the National Council for Science and Technology (CONACYT) launched an information system (to be completed by 2012) on available research infrastructures to help planning and investment decisions, to improve visibility and to guide researchers.

Clusters and regional policies: Mexico does not have a specific cluster policy, but has supported individual initiatives, such as an ICT cluster in the State of Jalisco, through the Prosoft programme, and Querétaro's Aerospace Park, notably through CONACYT's mixed funds.

Knowledge flows and commercialisation: The development of industry-science linkages has been included as a secondary objective for project selection in a number of innovation support programmes. Public-private partnerships are being encouraged by Strategic Alliances and Innovation Networks for Competitiveness (AERIs). Furthermore, support for the development of TTOs aims to accelerate the commercialisation of research outcomes and facilitate the creation of spin-offs.

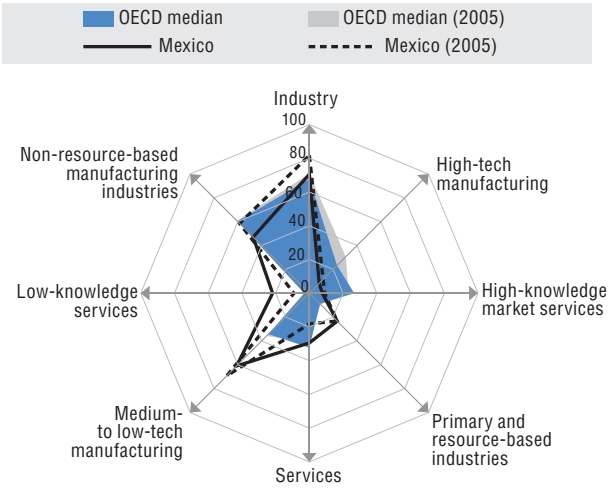
Human resources: The weak supply of human capital for S&T is a major bottleneck in Mexico's innovation system. Reforms have been recently introduced to improve primary and secondary education through more investment in school infrastructures, and attempts are made to increase teaching quality (introduction of a centralised exit exam to become a teacher in 2008, and a new incentive scheme focused on teacher performance in 2010). In higher education, the amount of scholarships has increased significantly, and collaboration with the business sector is encouraged (*e.g.* establishment of the Institutional Councils of Linkages, the IDEA programme, new curricula focused on the development of an entrepreneurship culture since 2011).

Emerging technology fields: Mexico has placed emphasis on nanotechnologies and biotechnologies, areas in which it currently has no RTA (Panel 3), through the development of two thematic networks (the Network for Agriculture and Food Biotechnology and a network dedicated to nanosciences and nanotechnologies). CONACYT has also signed bilateral agreements with Argentina and Brazil for the establishment of virtual centres in both fields.

Green innovation: Mexico's HEIs participate in the Green Agenda for Higher Education Technology Institutes which supports projects on clean technologies and renewable energy. These projects are complemented by research undertaken under the sectoral funds for environmental studies, for R&D in the water sector, and for R&D and technological innovation in forestry.

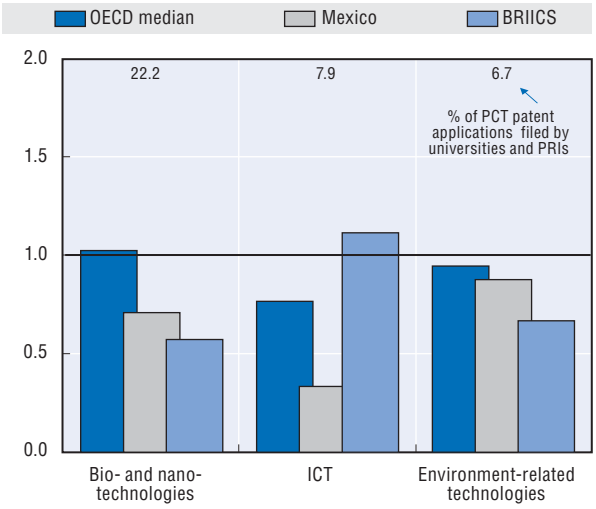
Panel 2. Structural composition of BERD, 2009

As a % of total BERD

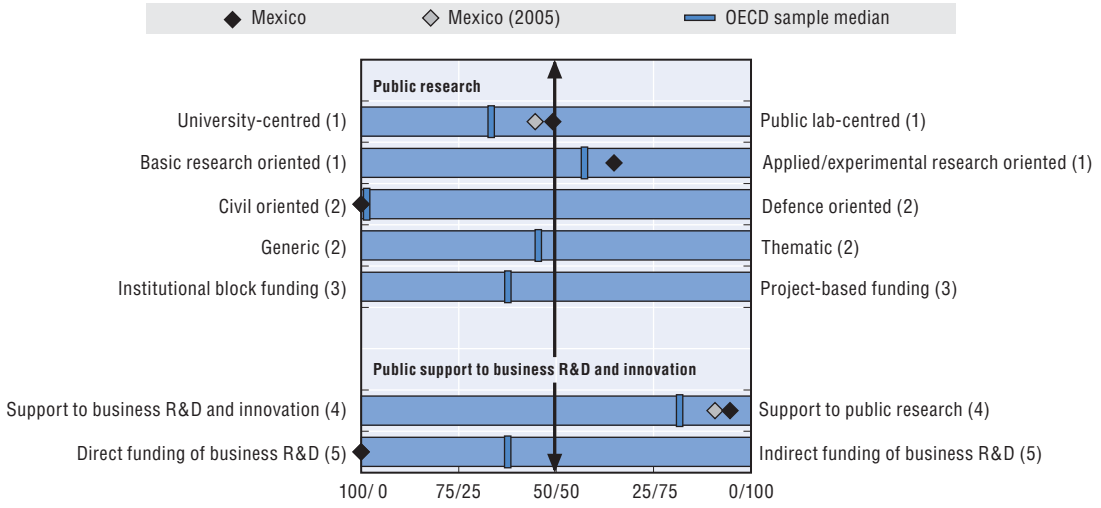


Panel 3. Revealed technology advantage in selected fields, 2007-09

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.

StatLink http://dx.doi.org/10.1787/888932690662