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ACRONYMS AND ABBREVIATIONS

AAFC—Agriculture and Agri-Food Canada
AECL—Atomic Energy of Canada Limited
BERD—Business enterprise expenditure on research and development
CFI—Canada Foundation for Innovation
CIHR—Canadian Institutes of Health Research
DFO—Fisheries and Oceans Canada
DND—National Defence
EC—Environment Canada
EU—European Union
GDP—Gross domestic product
GERD—Gross domestic expenditure on research and development
GOVERD—Government intramural expenditure on research and development
HC—Health Canada
HERD—Higher education expenditure on research and development
HRST—Human resources in science and technology
IC—Industry Canada
IP—Intellectual property
JPO—Japanese Patent Office
NRC—National Research Council Canada
NRCan—Natural Resources Canada
NSERC—Natural Sciences and Engineering Research Council of Canada
OECD—Organisation for Economic Co-operation and Development
OHIM—Office for Harmonization in the Internal Market (European Union)
PPP—Purchasing Power Parity
R&D—Research and development
RSA—Related scientific activities
S&T—Science and technology
SSHRC—Social Sciences and Humanities Research Council of Canada
StatCan—Statistics Canada
USPTO—United States Patent and Trademark Office
DEFINITIONS

R&D—“Research and development” is creative work undertaken on a systematic basis to increase the stock of knowledge and the use of this stock to devise new applications.

RSA—“Related scientific activities” contribute to the generation, dissemination and application of scientific and technological knowledge.

S&T—“Science and technology” includes both R&D and RSA and refers to the broad spectrum of activities required to generate, disseminate or apply new S&T knowledge.

Scientific publications—Publications in the fields of health, pure and applied science.

Trademark abroad—Trademark abroad corresponds to the number of applications filed with the USPTO, the OHIM and the JPO by application date and country of residence of the applicant. To correct for the presence of a home bias, the counts for the United States, EU members and Japan exclude applications in their domestic market and are rescaled.

Triadic patent family—a triadic patent family is a set of patents taken at the European Patent Office, the JPO and the USPTO to protect the same invention.
INTRODUCTION

*Science and Technology Data* is published yearly by Industry Canada’s Science and Innovation Sector. This publication presents a snapshot of the state of science and technology in Canada in an accessible and convenient format.

The booklet has five sections. The first, “National,” provides a summary view of Canada’s R&D. This is followed by three sections, each covering a specific player in the national S&T system: “Government,” “Industry” and “Higher Education.” The booklet concludes with a section entitled “Canada and the World,” which describes links between Canada’s S&T activities and those in other countries around the world.

Due to varied approaches to the national collection and multilateral compilation of data, the figures used for international comparisons may be for earlier periods than domestic equivalents. All figures are based on the most recent, reliable data.
GERD represents the total R&D performed in a country. In Canada, as in most other OECD countries, the business sector performs the most R&D. In 2010, the business sector performed 50.8 percent of Canada’s total R&D.

The ratio of GERD over GDP is a standard indicator of a country’s R&D effort. In 2009, Canada’s GERD intensity stood at 1.9 percent and was ranked 15th among OECD countries.

In Canada, the share of R&D performed by the public sector (governments and higher education institutions) is higher than in most OECD countries. Canada ranks second among G7 countries for the share of R&D performed by its public sector.
Canada’s GERD by Major Source of Funds, 2001 to 2010

Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221-X, January 2012.
# GERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2009

Distribution of R&D Expenditures by Performing Sector,
Selected OECD and Non-OECD Countries, 2009

Human Resources in S&T Occupations, Selected OECD Countries, 2010

Notes: Technicians and associate professionals include trade workers for Australia. The breakdown is not available for Canada and Korea.

Major Flows of Direct R&D Funding in Canada, 2010*

**Source of R&D Funding**

- **Federal**
  - $6 040M
  - $2 753M
  - $2 839M
- **Higher Education**
  - $5 182M
  - $2 923M
  - $5 182M
  - $11 145M
- **Provincial**
  - $1 576M
  - $1 054M
- **Private Not-for-Profit**
  - $961M
  - $923M
  - $337M
- **Foreign**
  - $2 162M
  - $2 033M
- **Business**
  - $13 418M
  - $12 378M
  - $14 895M

**R&D Performance**

*Only flows larger than $200 million are shown in the figure. The flows on this chart only include direct funding for R&D. They do not include tax expenditures.*

Source: Statistics Canada, CANSIM Database, Matrix 358-0001.
The Government of Canada is the second largest funder of R&D in Canada behind the business sector, funding 20.6 percent of the total R&D performed in Canada in 2010. Since 2007, the largest share of the federal government’s R&D funding has been directed to the higher education sector.

In addition to R&D, the Government of Canada also supports RSA. In 2011, RSA accounted for 36.8 percent of the Government of Canada’s total S&T expenditures. Among federal departments and agencies, CIHR had the largest R&D expenditures, whereas StatCan had the largest RSA expenditures. It should be noted that all these figures refer solely to direct expenditures on scientific activities. They do not include any indirect support provided through tax credits.

Figures on federal S&T personnel can be an indicator of intramural activity. In 2011, StatCan accounted for the largest share of the federal government’s total personnel engaged in S&T, whereas HC accounted for the largest share of its scientific and professional employees.

Federal R&D spending supports a variety of socio-economic objectives. Among them, public health, non-oriented research and industrial production attract the most funding. The largest share of this funding is allocated to R&D performed outside of the federal government (i.e., extramural).
Federal R&D Expenditures by Performer Type, 2002 to 2011

*Other includes private not-for-profit organizations, provincial and municipal governments, and other Canadian performers.

GOVERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2009

Note: Government expenditures include those by federal, provincial and local governments.

Federal S&T Expenditures by Activity, 2011 Intentions

Total Intended Spending: $11.3 Billion

R&D: 63.2%
RSA: 36.8%

RSA: $4.1B
Other*: 13.5%
Information Services: 16.3%
Special Services and Studies: 15.6%
Data Collection: 54.6%

*Other includes education support, administration of extramural programs and capital expenditures.

Note: Statistics Canada’s RSA expenditures include costs related to the conduct of the 2011 Censuses of Population and Agriculture.

Federal Personnel Engaged in S&T, by Major Departments and Agencies and Category, 2011

Federal R&D Expenditures by Socio-Economic Objective, 2009


In Canada, as in most other OECD countries, the business sector performs the greatest share of R&D. BERD has trended downward since the financial crisis, reaching $14.9 billion in 2010, which is 11.1 percent lower than its 2007 peak.

In 2009, Canada’s BERD-to-GDP ratio stood at 1.0 percent, which was lower than the OECD average (1.6 percent), and ranked 19th among OECD countries. Canada’s two largest provinces, Ontario and Quebec, accounted for 76.5 percent of Canada’s BERD and led all others in BERD intensity.

The business sector funds its R&D through a variety of sources, including governments. In Canada, the largest share of government support for business R&D is provided indirectly through the tax system.

Patents and trademarks are output indicators of business R&D. Compared to the OECD, Canada has a larger number of trademarks per capita, whereas the opposite is true for its triadic patent families.
Canada’s BERD by Major Source of Funds, 2001 to 2010

Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221-X, January 2012.
BERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2009

<table>
<thead>
<tr>
<th>Country</th>
<th>% of GDP</th>
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<tbody>
<tr>
<td>Israel</td>
<td>6.0</td>
</tr>
<tr>
<td>Finland</td>
<td>3.9</td>
</tr>
<tr>
<td>Korea</td>
<td>8.7</td>
</tr>
<tr>
<td>Japan</td>
<td>1.1</td>
</tr>
<tr>
<td>Japan (2008)</td>
<td>0.3</td>
</tr>
<tr>
<td>Sweden</td>
<td>3.7</td>
</tr>
<tr>
<td>Denmark</td>
<td>4.4</td>
</tr>
<tr>
<td>United States</td>
<td>3.6</td>
</tr>
<tr>
<td>Germany</td>
<td>2.4</td>
</tr>
<tr>
<td>Austria</td>
<td>5.6</td>
</tr>
<tr>
<td>Total OECD</td>
<td>3.2</td>
</tr>
<tr>
<td>France</td>
<td>5.1</td>
</tr>
<tr>
<td>Belgium</td>
<td>1.2</td>
</tr>
<tr>
<td>Australia</td>
<td>13.4</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>-0.2</td>
</tr>
<tr>
<td>Slovenia</td>
<td>7.6</td>
</tr>
<tr>
<td>Ireland</td>
<td>8.8</td>
</tr>
<tr>
<td>Iceland (2008)</td>
<td>1.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-2.1</td>
</tr>
<tr>
<td>Canada</td>
<td>3.8</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>7.1</td>
</tr>
<tr>
<td>Netherlands</td>
<td>-2.2</td>
</tr>
<tr>
<td>Portugal</td>
<td>24.2</td>
</tr>
<tr>
<td>Spain</td>
<td>6.1</td>
</tr>
<tr>
<td>Italy</td>
<td>4.8</td>
</tr>
<tr>
<td>Singapore</td>
<td>5.6</td>
</tr>
<tr>
<td>China</td>
<td>21.1</td>
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<tr>
<td>Russian Federation</td>
<td>3.5</td>
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Note: Government expenditures include those by federal, provincial and local governments.

BERD Intensity at the Provincial Level, 2001, 2005 and 2009

% of Provincial GDP

Direct and Indirect Government Funding of Business R&D and Tax Incentives for R&D, Selected OECD Countries, 2009

Note: Finland, Germany, Sweden and Switzerland do not provide R&D tax incentives. Italy provides tax incentives but cost estimates are not available.

Business Sector Personnel Engaged in R&D by Occupational Category, 2004 to 2008

Number (thousands)

Professionals | Technicians | Other

2004 | 2005 | 2006 | 2007 | 2008

Patents and Trademarks, OECD and Selected Non-OECD Countries, 2007 to 2009

In 2010, R&D performed by the higher education sector totalled $11.1 billion and accounted for 38.0 percent of the R&D performed in Canada. In 2009, Canada ranked fifth among OECD countries (first in the G7) for its HERD-to-GDP ratio.

Scientific publications are one measure of higher education institutions’ research output. Between 2000 and 2009, the volume of scientific publications in Canada increased 3.9 percent per year (compound annual growth rate). While the publication of scientific articles increased in most provinces, Ontario and Quebec accounted for the largest shares of Canada’s scientific articles.

When normalized by population, Canada’s output ranked first among G7 countries in 2009. Canada’s share of articles published in top-quartile* journals was 54.1 percent, placing it third among G7 countries.

* As ranked by the SCImago Journal & Country Rank indicator.
Canada’s HERD by Major Source of Funds, 2001 to 2010

*Other includes foreign and private not-for-profit organizations.

Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221-X, January 2012.
HERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2009

Graduation Rates at the Doctoral Level, Selected OECD Countries, 2000 and 2009

Percentage of population in the relevant age cohort

Volume of Scientific Publications, Canada, 2000 to 2009

*Data for 2009 are incomplete. Certain journals published in 2009 will only be documented in 2010. As a result, the counts for 2009 should be revised upwards by up to 10%.

Source: Observatoire des sciences et des technologies (Thomson Reuters—Web of Science).
Scientific Publications by Province, 1999 and 2009

*Data for 2009 are incomplete. Certain journals published in 2009 will only be documented in 2010.

Source: Observatoire des sciences et des technologies (Thomson Reuters—Web of Science).
*Publication counts in top-quartile journals are those published in the most influential 25 percent of the world’s scholarly journals in their category, as ranked by the SCImago Journal & Country Rank indicator.

Distribution of Scientific Articles by Discipline, Canada and the United States, 2009*

*Data for 2009 are incomplete. Certain journals published in 2009 will only be documented in 2010.
Source: Observatoire des sciences et des technologies (Thomson Reuters—Web of Science).
In Canada, the share of BERD funded from foreign sources declined from 15.9 percent to 12.4 percent between 2007 and 2008, recovering partially to 13.6 percent in 2010. Nevertheless, Canada ranks second among G7 countries (eighth in the OECD) for its share of BERD funded from foreign sources.

Canadian researchers collaborate predominantly with those in the United States. In 2009, 47.6 percent of the internationally co-authored scientific articles in Canada involved an American co-author. The United Kingdom (13.6 percent) and France (10.7 percent) were second and third respectively. Between 1999 and 2009, collaboration with China increased significantly. In 2009, 10.2 percent of the internationally co-authored scientific papers in Canada involved a Chinese co-author, up from 2.5 percent in 1999.
Percentage of BERD Funded by Foreign Sources, Canada, 2001 to 2010

Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221-X, January 2012.
Percentage of BERD Funded by Foreign Sources, Top OECD Countries, 2009

R&D Expenditures by Foreign-Controlled Affiliates, 2008

% of BERD

Internationally Co-Authored Scientific Articles, Canada’s Top 10 Collaborating Countries, 1999 and 2009

Percentage of internationally co-authored scientific papers

Source: Observatoire des sciences et des technologies (Thomson Reuters—Web of Science).
R&D Intensity and Volume, Selected OECD and Non-OECD Countries, 2009