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SCIENCE AND TECHNOLOGY DATA — 2008

April 2010

National • Government • Industry • Higher Education • Canada and the World

Canada

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CONTENTS

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
CIDA — Canadian International Development Agency
CIHR — Canadian Institutes of Health Research
CSA — Canadian Space Agency
DND — Department of National Defence
EC — Environment Canada
F&O — Fisheries and Oceans Canada
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
IC — Industry Canada

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

R&D — Research and development

RSA — Related scientific activities

S&T — Science and technology

SR&ED — Scientific Research and Experimental Development

SSHRC — Social Sciences and Humanities Research Council of Canada

STC — Statistics Canada

DEFINITIONS

R&D — "Research and Development" is creative work undertaken on a systematic basis to increase the stock of knowledge, including knowledge of humankind, culture and society, and the use of this stock of knowledge to devise new applications.

RSA — "Related Scientific Activities" that complement and extend R&D by contributing 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.

Technology Receipts — Technology receipts measure one dimension (income) from international technology transfers: licence fees, patents, purchases and royalties paid, know-how, research and technical assistance.

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 the varied approaches to national collection and multilateral compilation of data, the figures used for international comparisons will often be for earlier periods than those used for domestic trends. All figures are based on the most recent, reliable data.

NATIONAL

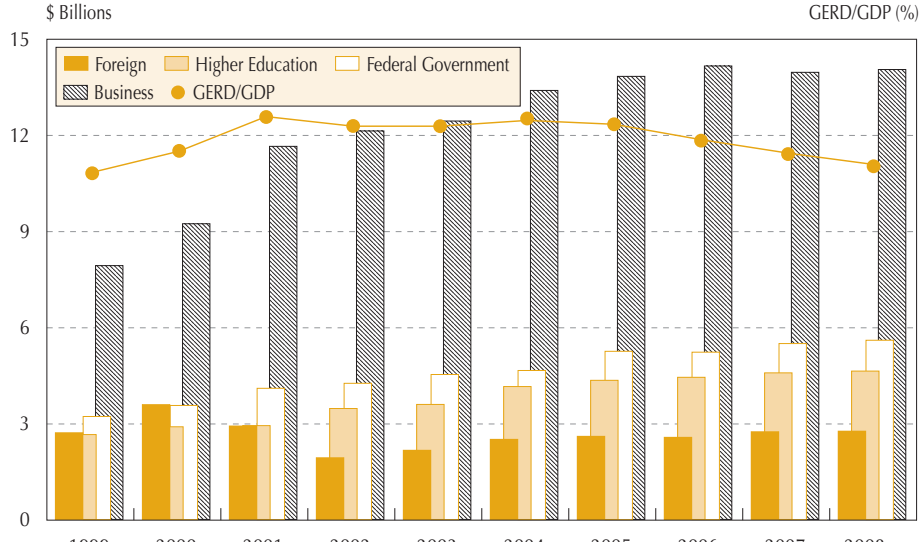
GERD represents the total R&D performed in a country. In Canada, as in most other OECD countries, the business sector is the most important performer of R&D and its largest funder. In 2008, businesses funded $14.0 billion of Canada's $29.5 billion in R&D expenditures.

GERD, expressed as a percentage of GDP, is a standard indicator of the share of resources a country devotes to R&D (i.e., its R&D intensity). In 2007, Canada's GERD-to-GDP ratio stood at 1.9 percent and was ranked 13th among OECD countries.

The GERD-to-GDP ratio in Canada's two largest provinces, Quebec and Ontario, exceeded that of the OECD area in 2006.

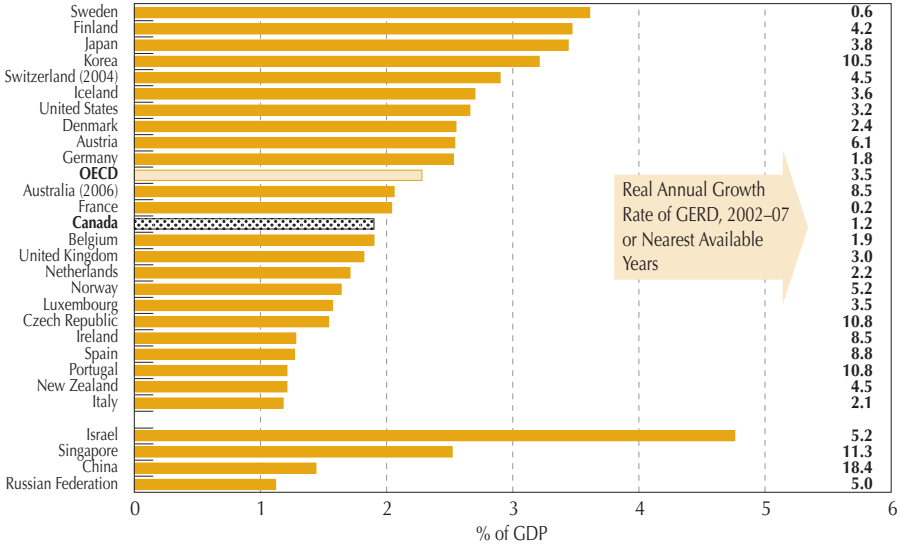
Compared to other OECD countries, Canada's higher education sector performs a larger share of its aggregate R&D (35 percent compared to 17 percent). Meanwhile, the relative contribution of the business sector is smaller (54 percent compared to 70 percent).

Canada's GERD by Major Source of Funds, 1999 to 2008



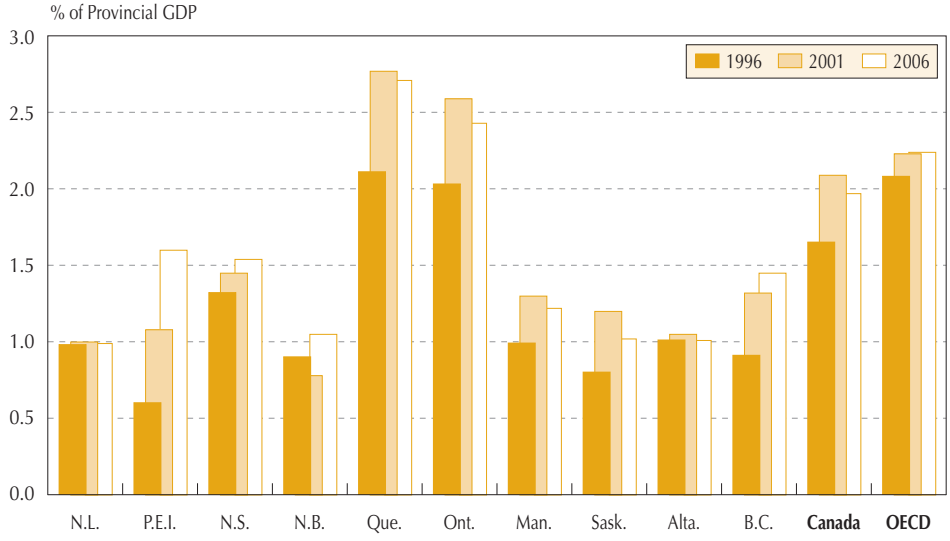
Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221, December 2009.

GERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2007



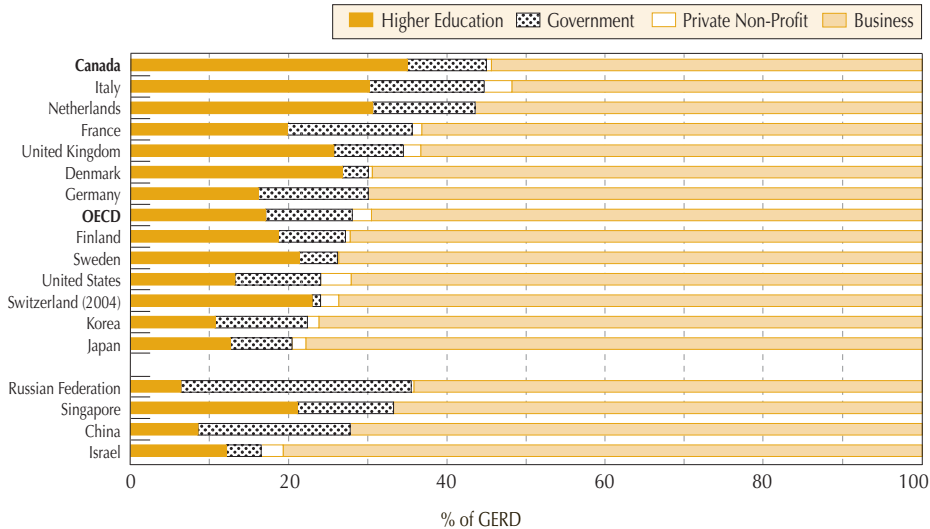
Source: OECD, *Main Science and Technology Indicators:* 2009/2 edition, December 2009.

R&D Intensity at the Provincial Level, 1996, 2001 and 2006



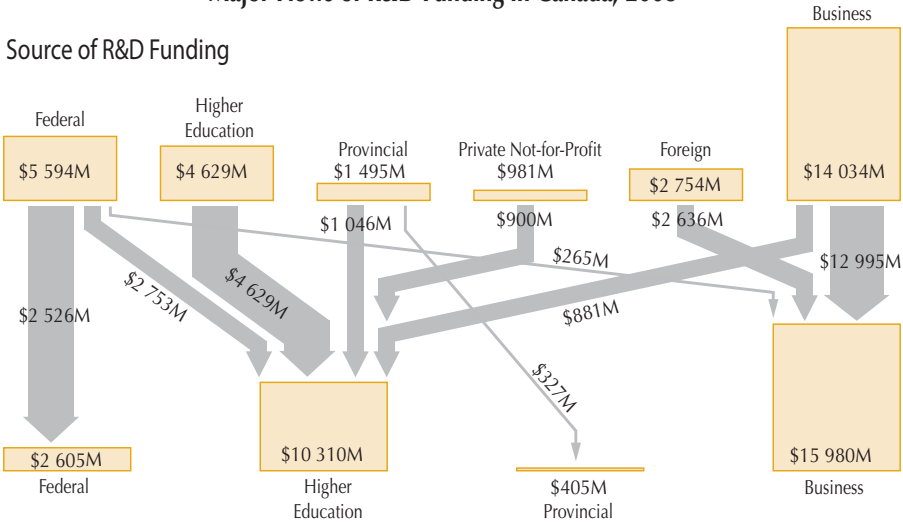
Sources: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces,* Catalogue no. 88-221, December 2009. OECD, *Main Science and Technology Indicators:* 2009/2 edition, December 2009.

Distribution of R&D Expenditures by Performing Sector, Selected OECD and Non-OECD Countries, 2007



Source: OECD, *Main Science and Technology Indicators:* 2009/2 edition, December 2009.

Major Flows of R&D Funding in Canada, 2008*



*Only flows larger than $150M are shown in the chart.

Source: Statistics Canada, CANSIM Database, Matrix 358-0001.

GOVERNMENT

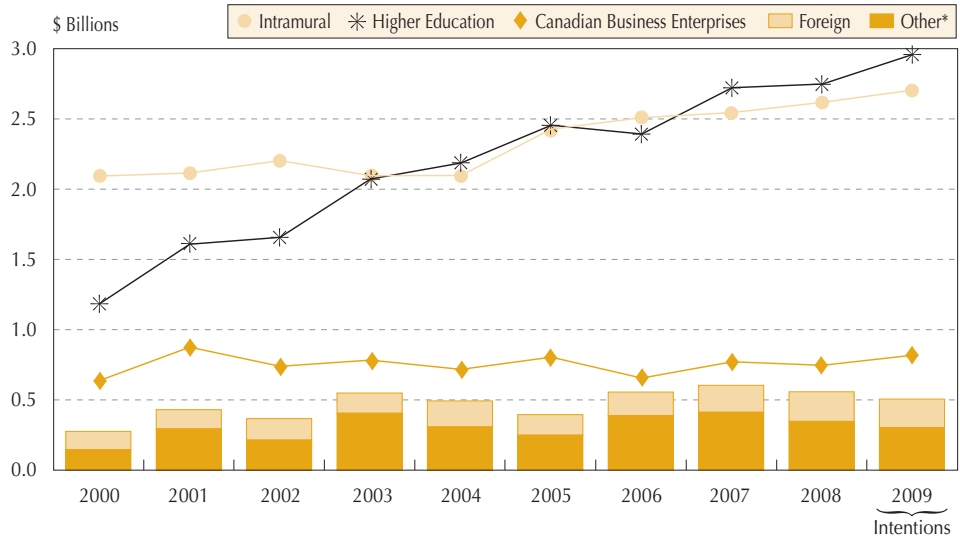
In 2008, the federal government funded 19 percent of the R&D performed in Canada. It is the country's second-largest funder of R&D, behind the business sector (48 percent). The federal government splits most of its support between higher education and intramural performers.

In 2007, governments performed 11 percent of the R&D in the OECD. Expressed as a percentage of GDP, Canada's GOVERD ranked 17th among OECD countries in 2007.

S&T expenditures include only direct spending on both R&D and RSA. These do not include indirect measures such as tax credits. Some departments or agencies, such as the granting councils (NSERC, CIHR, SSHRC) provide funds to universities, while others, such as the NRC, perform mostly in-house R&D. Departments such as STC perform mostly RSA.

Federal R&D dollars support a variety of socio-economic objectives. In 2007, public health and industrial production were the top recipients and accounted for 34 percent of the total.

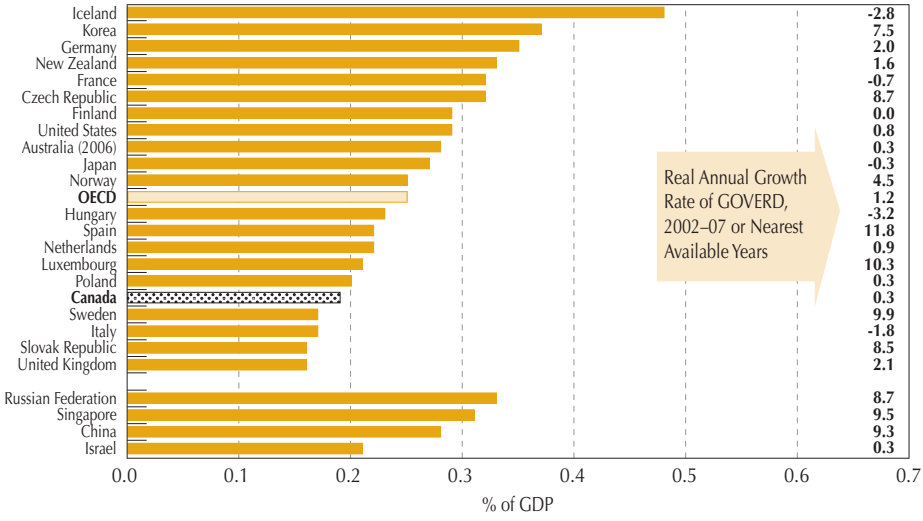
Federal R&D Spending by Performer Type, 2000 to 2009



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

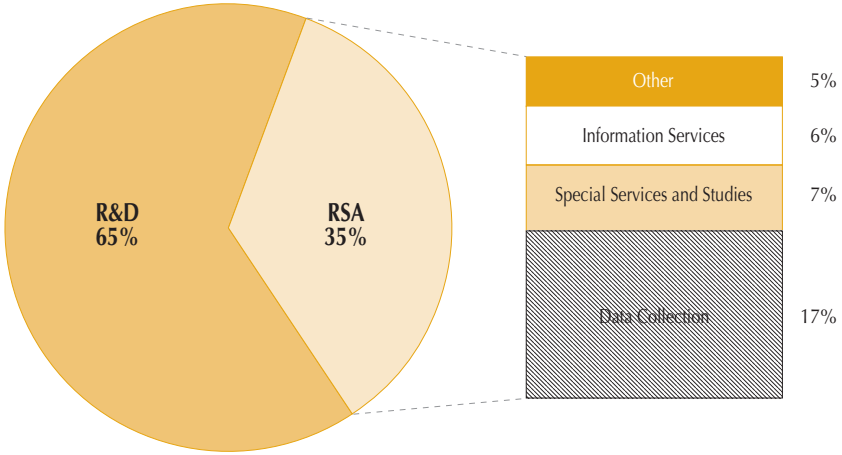
Source: Statistics Canada, *Science Statistics*, Vol. 33, No. 6, October 2009.

GOVERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2007



Note: Government expenditures include those by federal, provincial and local governments.
Source: OECD, *Main Science and Technology Indicators:* 2009/2 edition, December 2009.

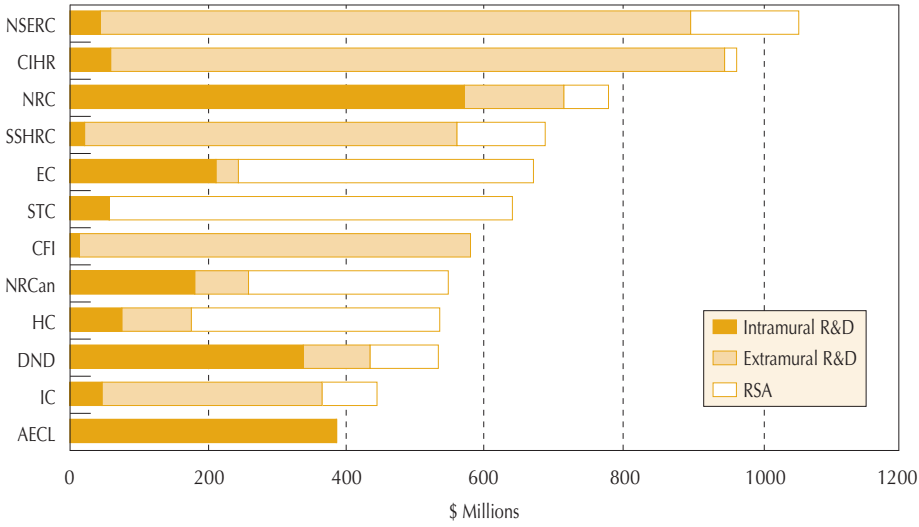
Federal S&T Spending by Activity, 2009 Intentions



Total Intended Spending: $10.7B

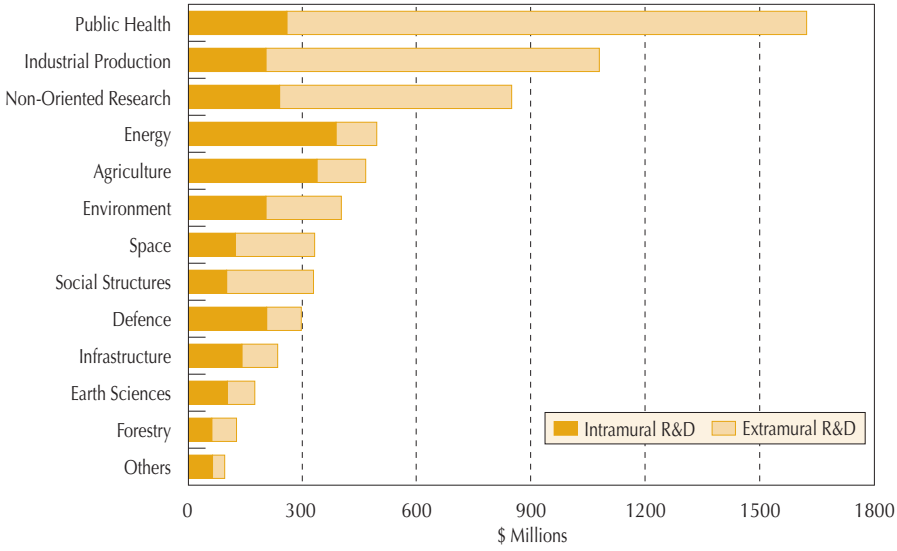
Source: Statistics Canada, *Science Statistics*, Vol. 33, No. 6, October 2009.

Major Federal S&T Departments and Agencies by Amount of Spending, 2009 Intentions



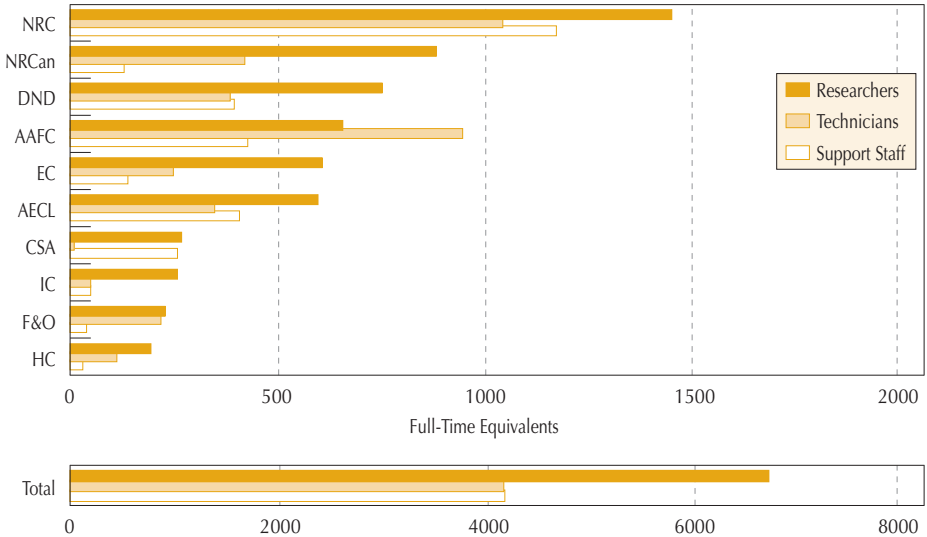
Source: Statistics Canada, *Science Statistics*, Vol. 33, No. 6, October 2009.

Federal R&D Spending by Socio-Economic Objective, 2007



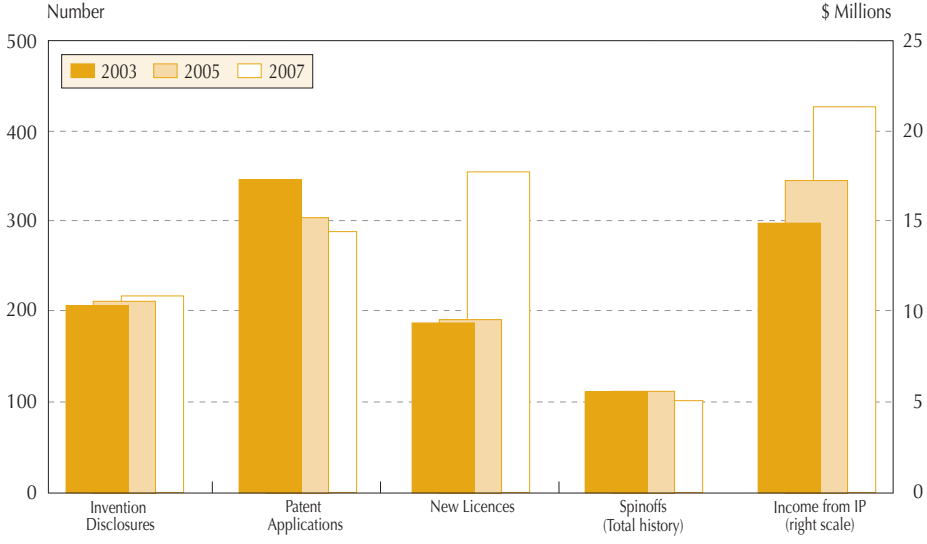
Source: Statistics Canada, *Science Statistics*, Vol. 33, No. 6, October 2009.

Federal Personnel Engaged in R&D, by Occupation, Major Departments or Agencies, 2006



Source: Statistics Canada, *Science Statistics*, Vol. 33, No. 3, June 2009.

Federal Government Licensing and IP Income, 2003, 2005 and 2007



Source: Statistics Canada, *Intellectual Property Management, by Federal Departments and Agencies Indicators*, CANSIM Table 358-0026.

INDUSTRY

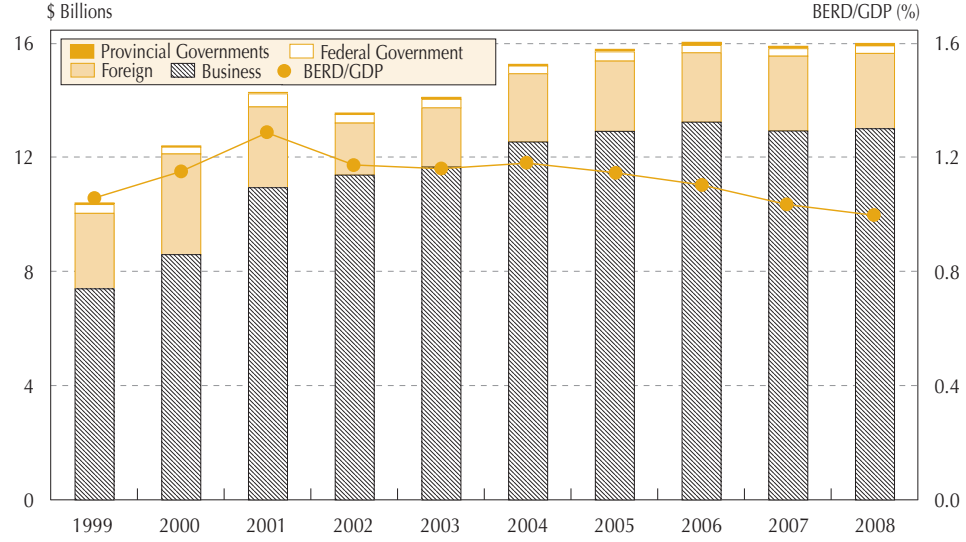
Over half of the R&D performed in Canada is performed by the business sector. In 2008, businesses performed 54 percent ($16.0 billion) of Canada's R&D. Most of Canada's BERD is funded by the business sector itself (81 percent).

In 2007, Canada ranked 16th among OECD countries for its BERD-to-GDP ratio. Canada's ratio has declined since 2004, as GDP growth outpaced that of its BERD. Smaller firms perform a significant share of Canada's BERD. In 2006, 36 percent of Canada's BERD was performed by firms with fewer than 250 employees.

Canada ranked above the OECD average for its number of business researchers (per thousand employment) and stood in the middle of G7 countries, behind the U.K., the U.S. and France, for its venture capital investment.

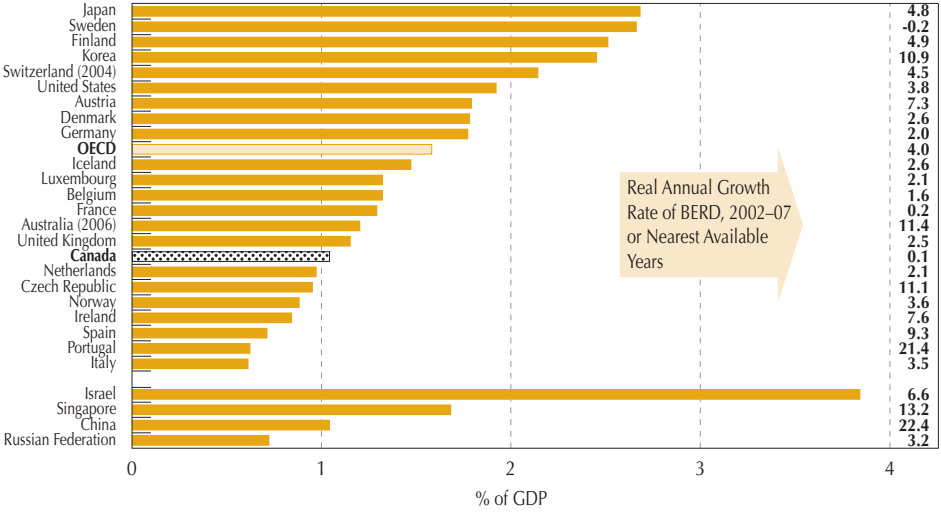
As was witnessed for the OECD and in other G7 countries, direct government funding of BERD declined in Canada over the past 10 years (1997–2007). Over this period, the share of BERD funded by government declined to 2.3 percent. It should be noted that this figure includes only direct funding by governments and excludes indirect support, such as SR&ED tax credits.

Canada's BERD by Major Source of Funds, 1999 to 2008



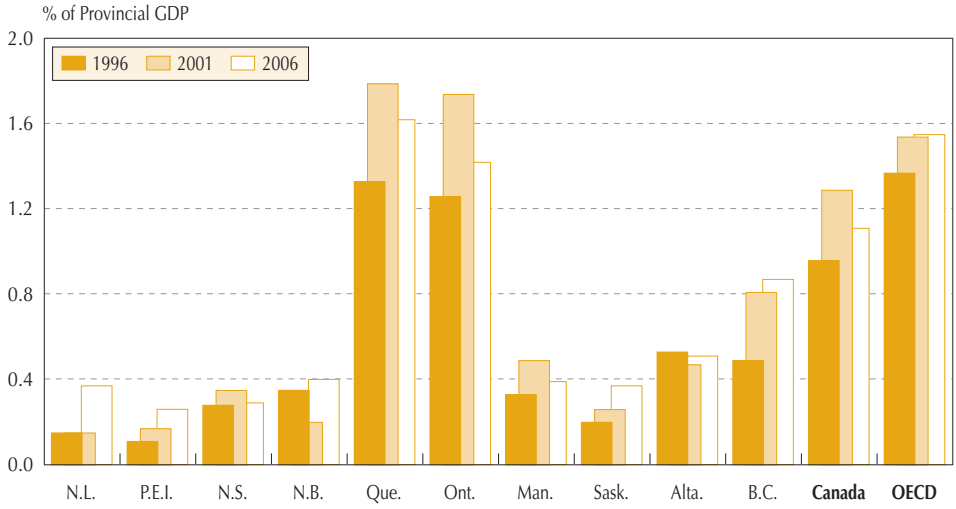
Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221, December 2009.

BERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2007



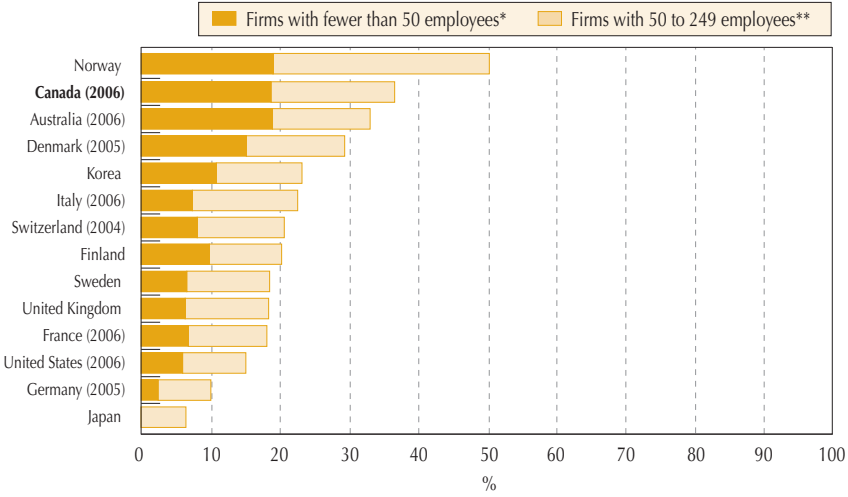
Note: Government expenditures include those by federal, provincial and local governments.
Source: OECD, *Main Science and Technology Indicators*: 2009/2 edition, December 2009.

BERD Intensity at the Provincial Level, 1996, 2001 and 2006



Sources: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221, December 2009. OECD, *Main Science and Technology Indicators:* 2009/2 edition, December 2009.

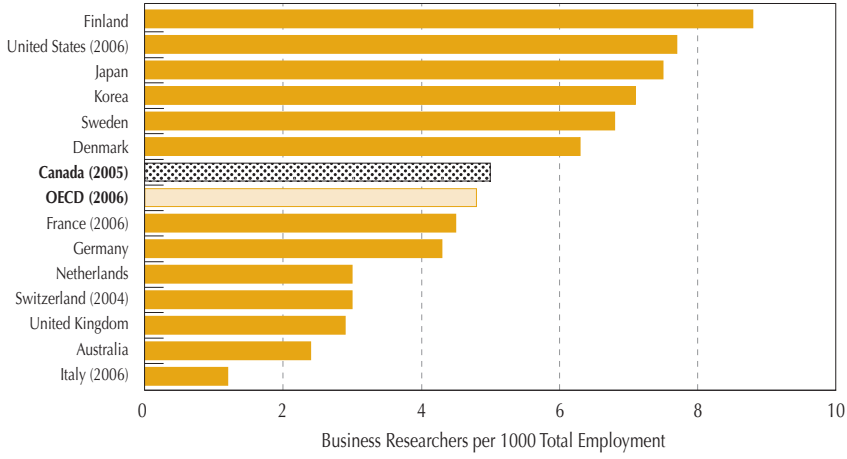
Share of Business R&D by Size Class of Firms, Selected OECD Countries, 2007



*For the United States, 5–49 employees and for Sweden, 10–49 employees.
**For Japan, fewer than 299 employees.

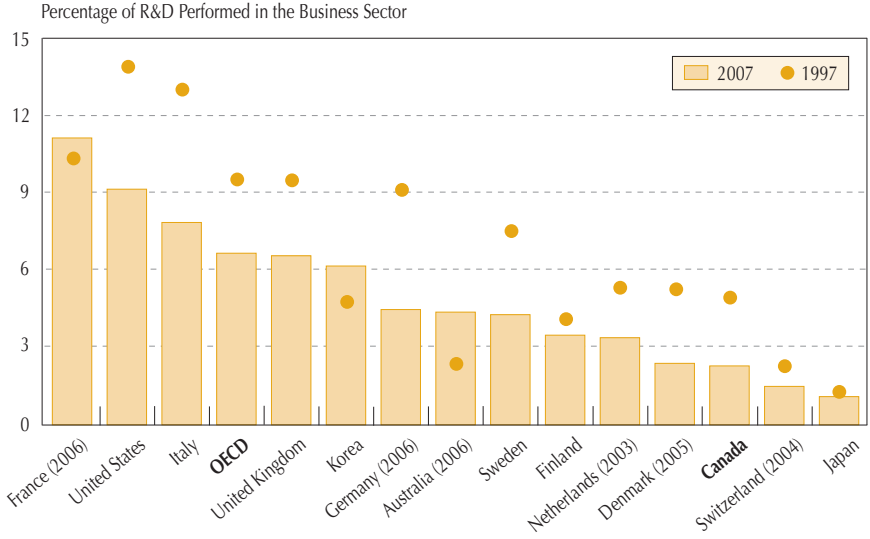
Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

Business Researchers per Thousand Total Employment, Selected OECD Countries, 2007



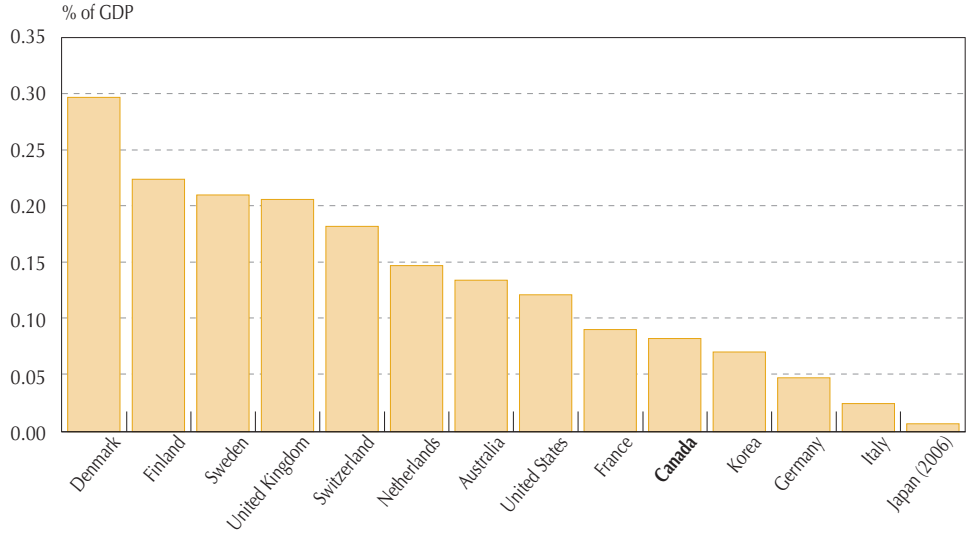
Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

Government-Financed R&D in Business, Selected OECD Countries, 1997 and 2007



Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

Venture Capital Investment as a Percentage of GDP, Selected OECD Countries, 2008



Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

HIGHER EDUCATION

The higher education sector is Canada's second-largest performer of R&D. Canada's HERD reached $10.3 billion in 2008 and accounted for 35 percent of the R&D performed in Canada.

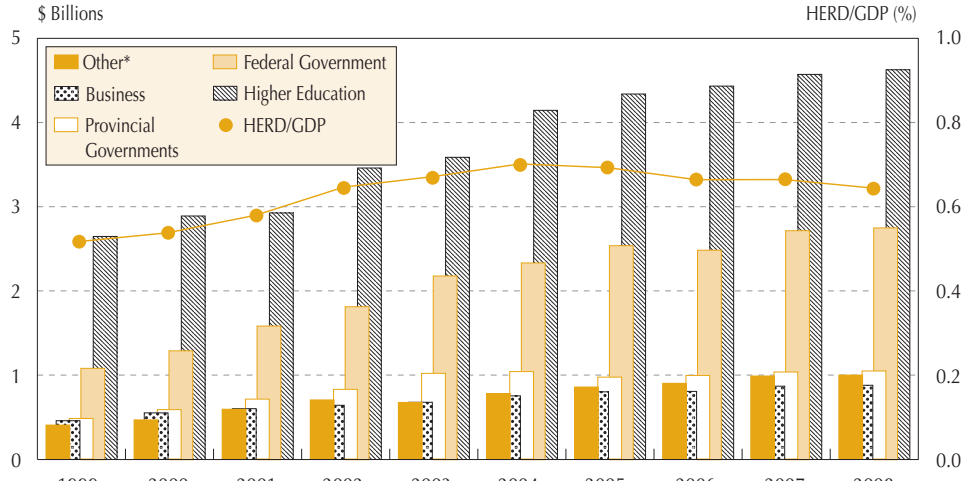
In 2007, Canada ranked first among G7 countries for its HERD-to-GDP ratio. Over the 2002–2007 period, real higher education expenditures on R&D grew 3.2 percent per year in Canada. This is slightly higher than the 3.1 percent growth witnessed in the OECD.

As in most countries, Canadians with university degrees tend to earn more than those without. However, this premium to education appears lower in Canada than in most other G7 countries.

Compared to other OECD countries, Canada grants a high proportion of its degrees in the areas of S&T. Among G7 countries, Canada ranks fifth for its share of natural sciences and engineering degrees and first for social science degrees. At the doctoral level, Canada's graduation rate stands below that of other G7 countries.

Natural science and engineering publications are one output of the higher education sector. The breakdown of these publications by field of science suggests that in 2007, Canada had relative strengths in biology and engineering and technology compared to other G7 countries.

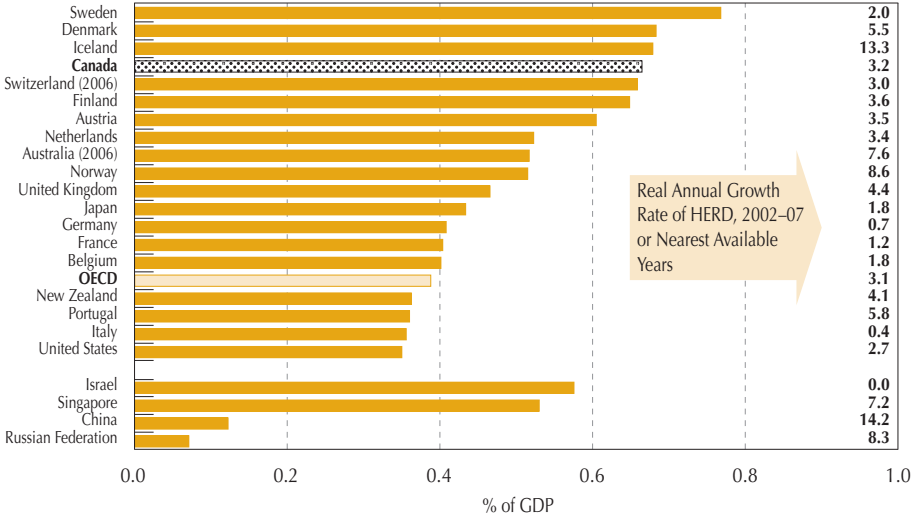
Canada's HERD by Major Source of Funds, 1999 to 2008



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

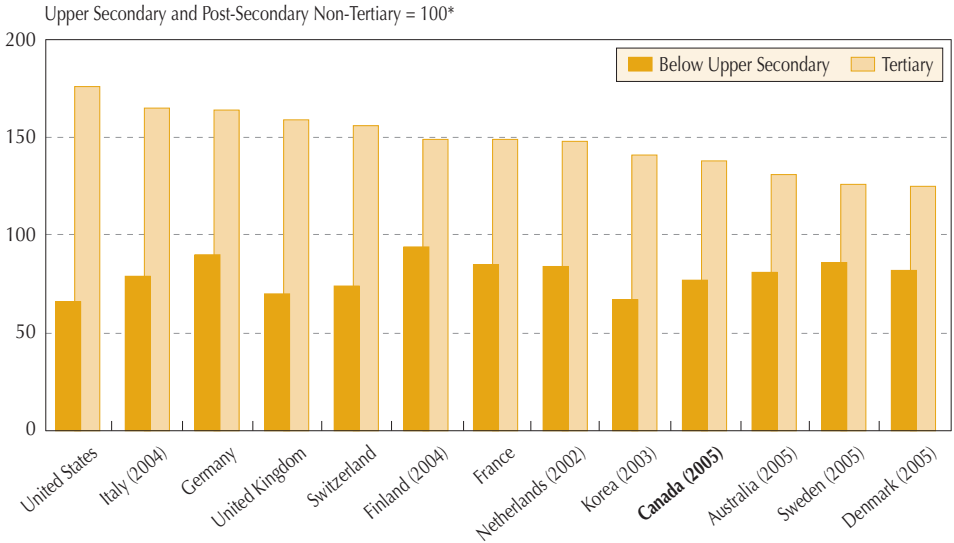
Source: Statistics Canada, *Gross Domestic Expenditures on Research and Development in Canada (GERD), and the Provinces*, Catalogue no. 88-221, December 2009.

HERD as a Percentage of GDP, Top OECD and Selected Non-OECD Countries, 2007



Source: OECD, *Main Science and Technology Indicators*: 2009/2 edition, December 2009.

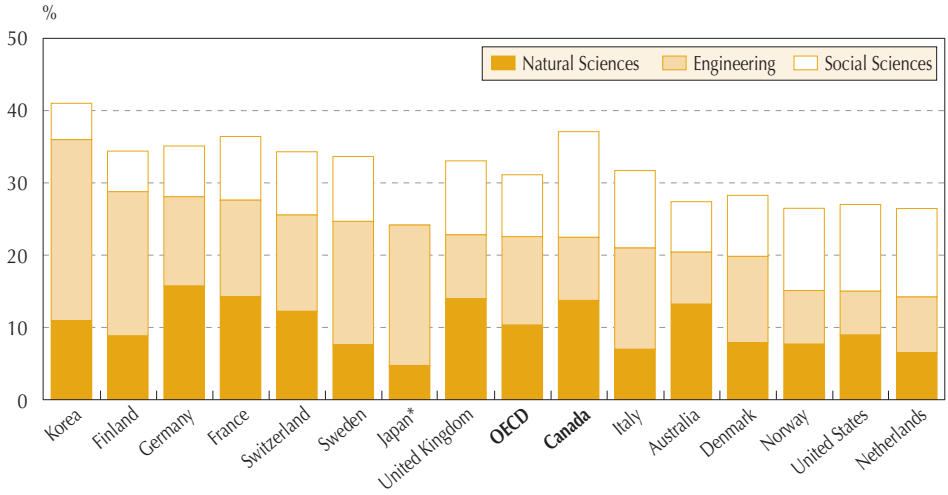
Relative Earnings by Level of Education, Selected OECD Countries, 2006



*This level includes programmes that straddle the boundary between upper secondary and post-secondary education from an international point of view.

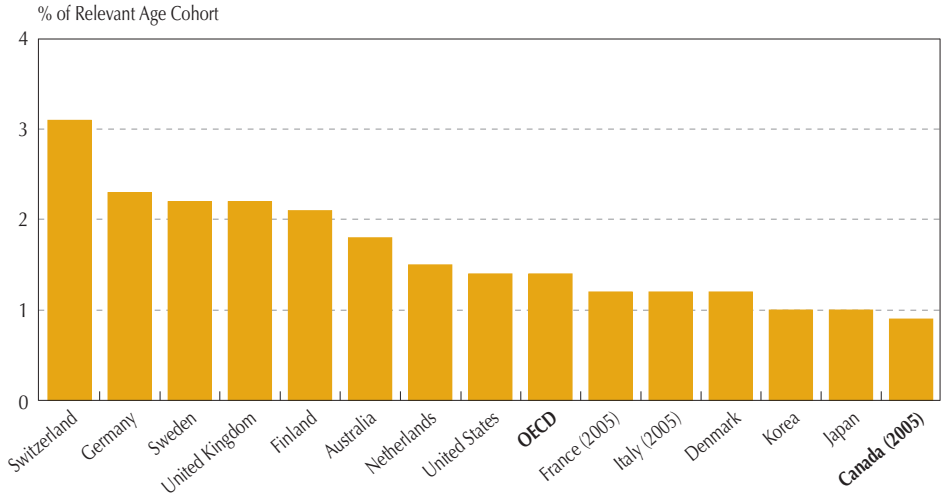
Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

Science and Engineering Degrees as a Percentage of New Degrees, Selected OECD Countries, 2007



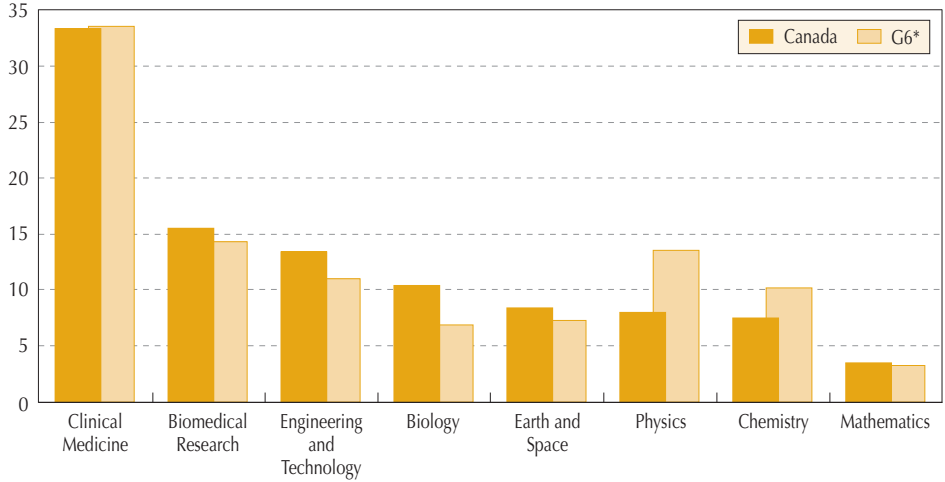
*The value pertaining to social science degrees was unavailable.
Source: OECD, *Education Database*, OECD.Stat extract, January 2010.

Graduation Rates at the Doctoral Level, Selected OECD Countries, 2006



Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

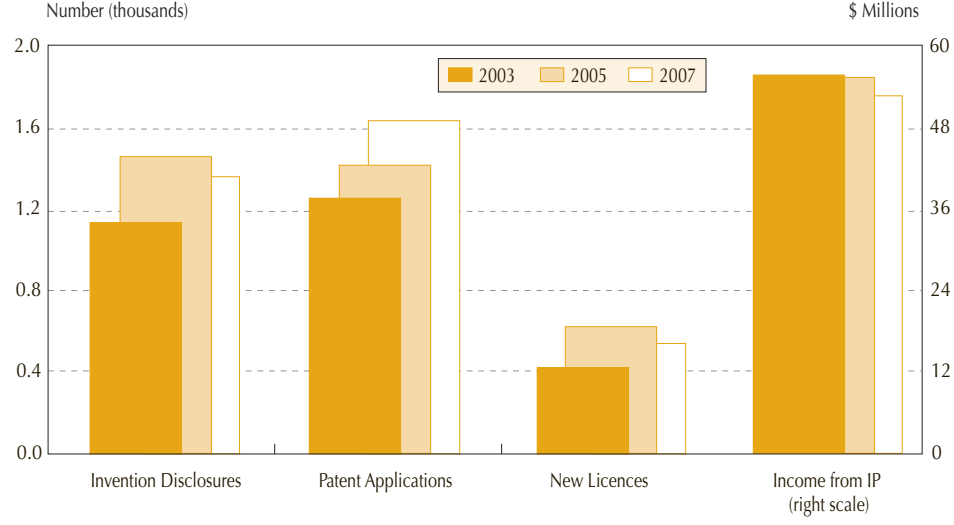
Scientific Publications, Distribution by Field of Science, Canada and the G6, 2007



*G6 includes France, Germany, Italy, Japan, the United Kingdom and the United States.

Source: Institut de la Statistique du Québec, *Compendium d'Indicateurs de l'activité scientifique et technologique au Québec,* Édition 2009.

Selected Commercialization Output of University Research, 2003, 2005 and 2007



Source: Statistics Canada, *Survey of Intellectual Property Commercialization, by Higher Education Sector Indicators,* Annual, CAMSIM Table 358-0025.

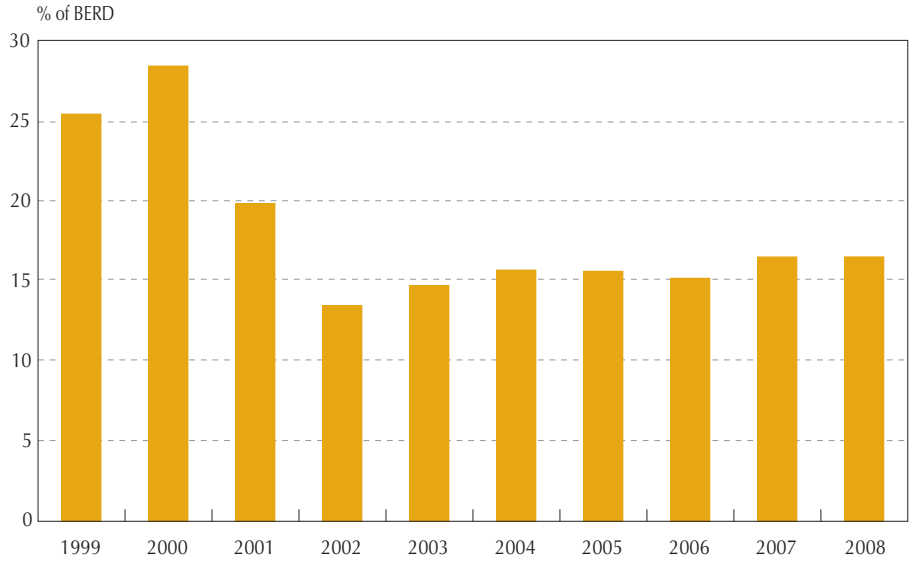
CANADA AND THE WORLD

In 2008, foreign sources funded 16 percent of Canada's BERD. While this is lower than the peak (28 percent) attained in 2000, Canada ranks third among OECD countries for its share of foreign-financed BERD.

Affiliates under foreign control account for a larger share of R&D and turnover in Canada than in most other G7 countries.

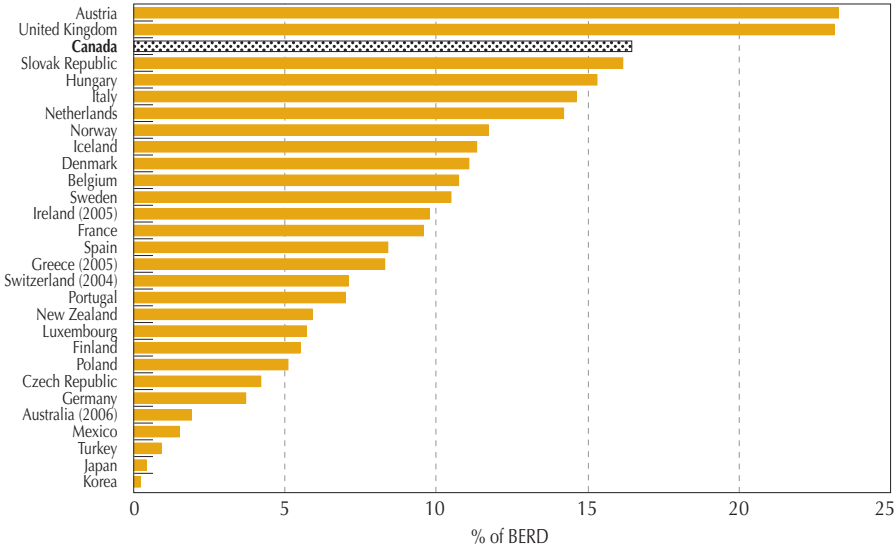
Canadian researchers are also collaborating with international counterparts. In 2007, 45 percent of Canadian scientific articles were produced with a foreign co-author.

Percentage of BERD Funded by Foreign Sources, Canada, 1999 to 2008



Source: OECD, *Main Science and Technology Indicators*: 2009/2 edition, December 2009.

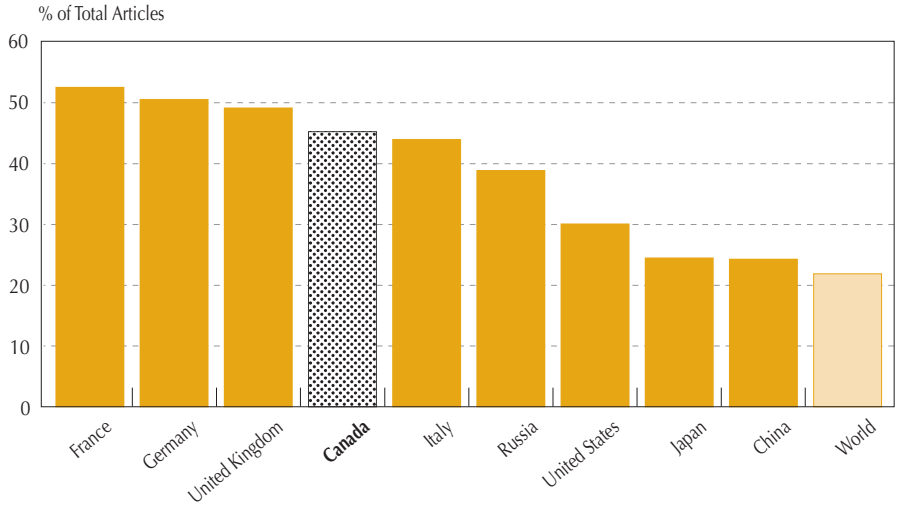
Percentage of BERD Funded by Foreign Sources, OECD Countries,* 2007



*Data for the United States are unavailable.

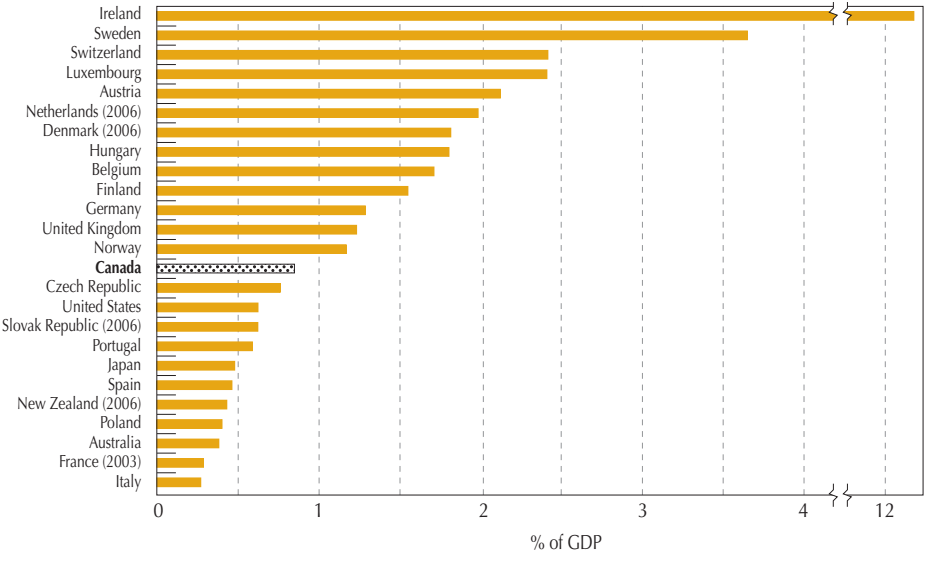
Source: OECD, *Main Science and Technology Indicators:* 2009/2 edition, December 2009.

Internationally Co-Authored Scientific Articles, Selected OECD and Non-OECD Countries, 2007



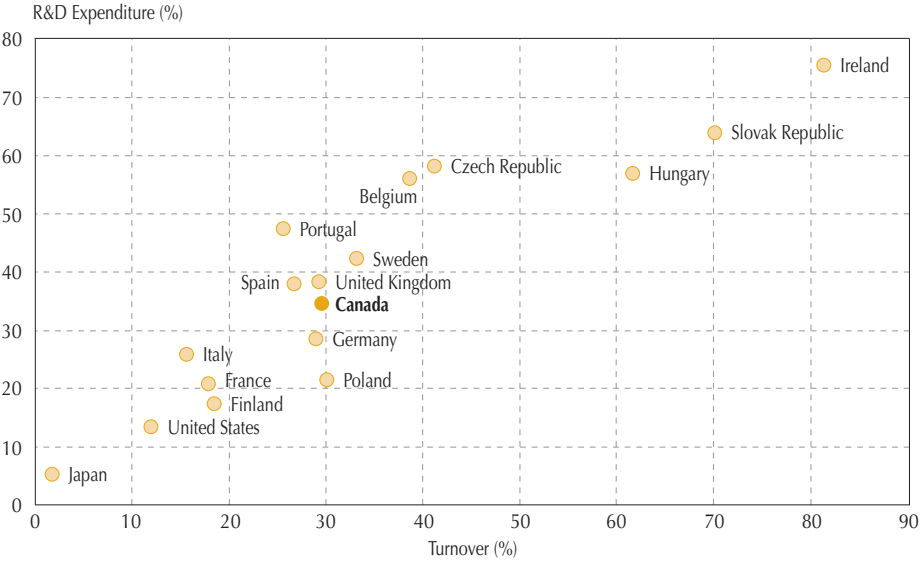
Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

Technology Receipts as a Percentage of GDP, Top OECD Countries, 2007



Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

R&D and Turnover of Affiliates under Foreign Control, Selected OECD Countries, 2006



Source: OECD, *Science, Technology and Industry Scoreboard 2009*, 2009.

NOTES