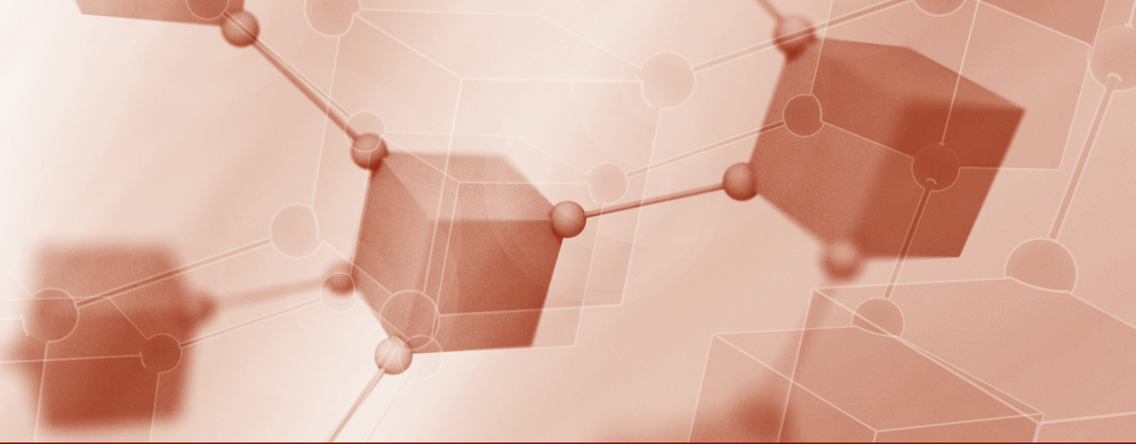

SCIENCE AND TECHNOLOGY DATA — 2005

March 2007

Government of Canada   Gouvernement du Canada

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CONTENTS

ACRONYMS AND ABBREVIATIONS

AAFC — Agriculture and Agri-Food Canada
BERD — Business enterprise expenditure on research and development
CFI — Canada Foundation for Innovation
CIDA — Canadian International Development Agency
CIHR — Canadian Institutes of Health Research
DND — Department of National Defence
EC — Environment Canada
GDP — Gross domestic product
GERD — Gross domestic expenditure on research and development
GOVERD — Government intramural expenditure on research and development
HERD — Higher education expenditure on research and development
IC — Industry Canada
ICT — Information and communications technology
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

SSHRC — Social Sciences and Humanities Research Council of Canada

STC — Statistics Canada

USPTO — United States Patent and Trademark Office

DEFINITIONS

Relative Weighted Impact Factor — This indicator is a proxy for the quality of the journals in which an entity publishes. The index takes into account the number of citations a journal receives in a year, the number of articles the journal publishes in a year, and the disciplinary variation in citation patterns. An impact factor above one means the entity scores better than the world average.

R&D — Research and development refers to the creative work undertaken on a systematic basis to increase the stock of scientific and technical knowledge and to use this knowledge in new applications.

RSA — Related scientific activities refers to those activities that complement and reinforce R&D. These activities include scientific data collection, testing and standards development, feasibility studies and education support, such as scholarships.

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

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

Triadic Patent Family — An invention on which a patent application has been filed at the European and Japanese Patent Offices and granted in the United States Patent Office.

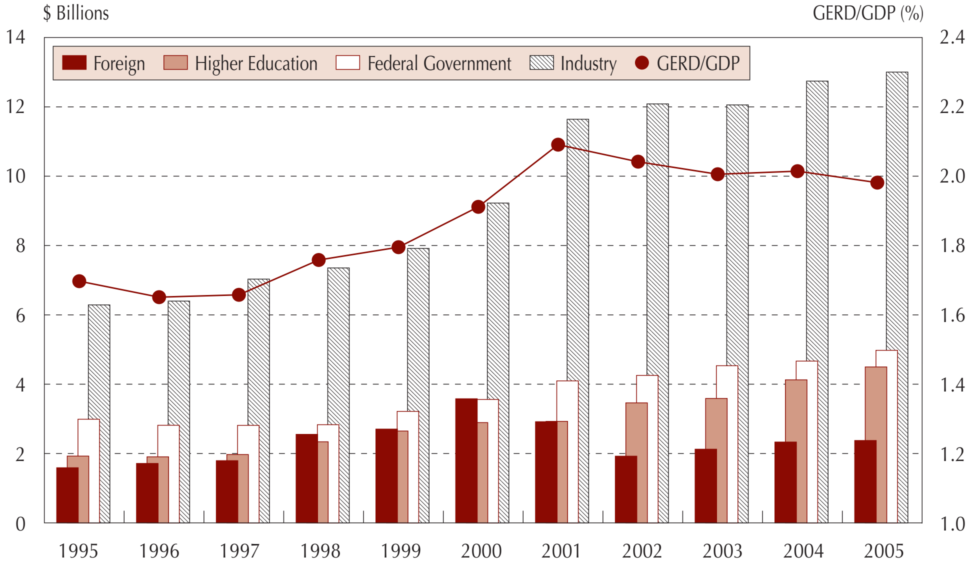
4 NATIONAL

GERD represents total R&D expenditures performed in the country. Over the past 10 years, these expenditures for Canada increased significantly, reaching $27 billion in 2005. However, Canada's ratio of GERD over GDP is still low by international standards. Canada ranks 12th among OECD countries and stands below the OECD average.

GERD can be broken down either by performers (those who spend the money) or funders (those who supply the money). In Canada, as in other major OECD countries, the business sector leads both in terms of R&D performed and R&D financed. However, Canadian businesses perform a smaller share of the national R&D than in most other leading OECD economies.

National figures can hide significant regional differences. The bulk of Canada's R&D is performed in the two largest provinces: Ontario and Quebec. Only these two provinces have R&D intensities comparable to the OECD average.

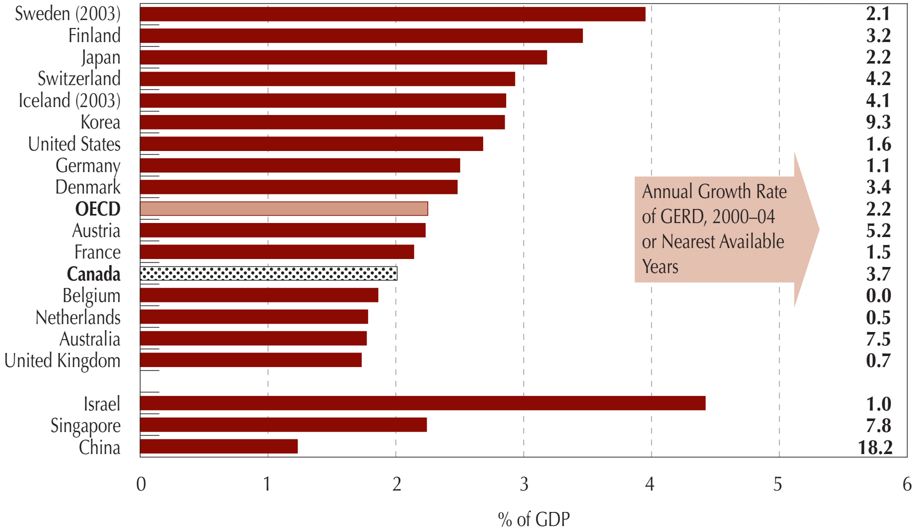
Canada's GERD by Major Source of Funds, 1995 to 2005



Source: Statistics Canada, *Science Statistics*, Vol. 30, No. 07, September 2006.

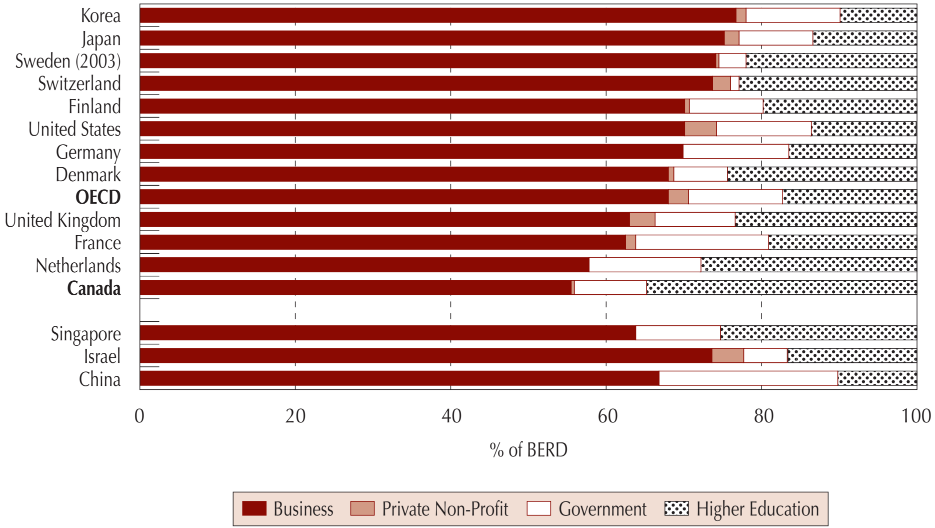
6

GERD as a Percentage of GDP, Top OECD and Selected Non-OECD Countries, 2004



Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

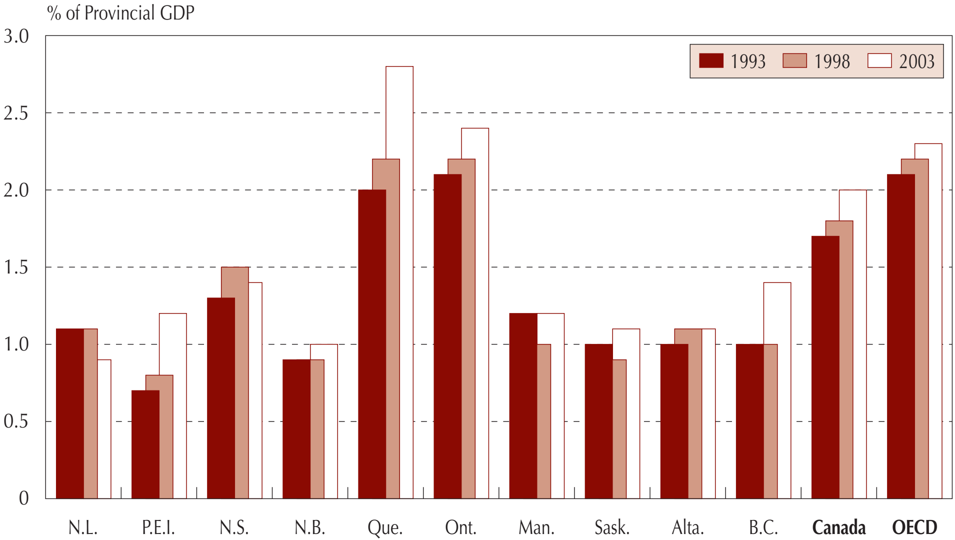
R&D Expenditures by Performing Sector, Selected OECD and Non-OECD Countries, 2004



Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

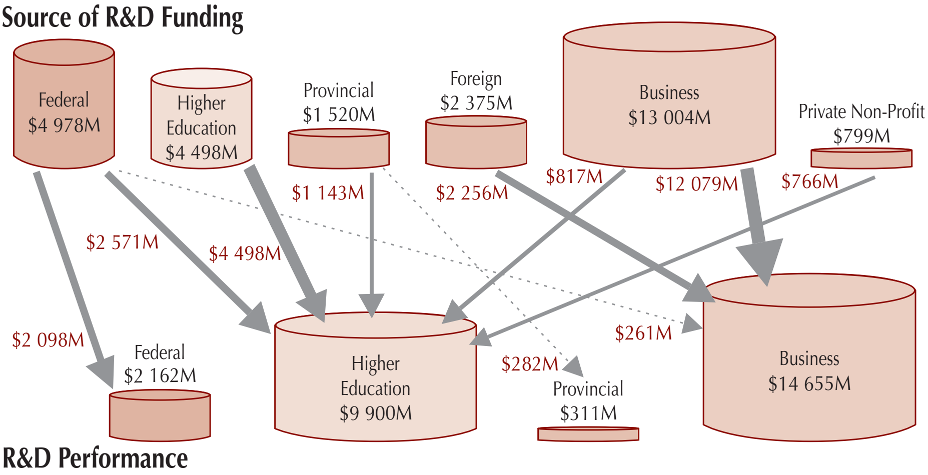
8

R&D Intensity at the Provincial Level, 1993, 1998 and 2003



Source: Statistics Canada, *Science Statistics*, Vol. 30, No. 07, September 2006 and OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

Major Flows of R&D Funding in Canada, 2005*



*Only flows higher than $120M are shown in the figure.

Source: Statistics Canada, *Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1995 to 2006, and by Province 1995 to 2004*, Cat. No. 88F0006XIE No. 009, September 2006.

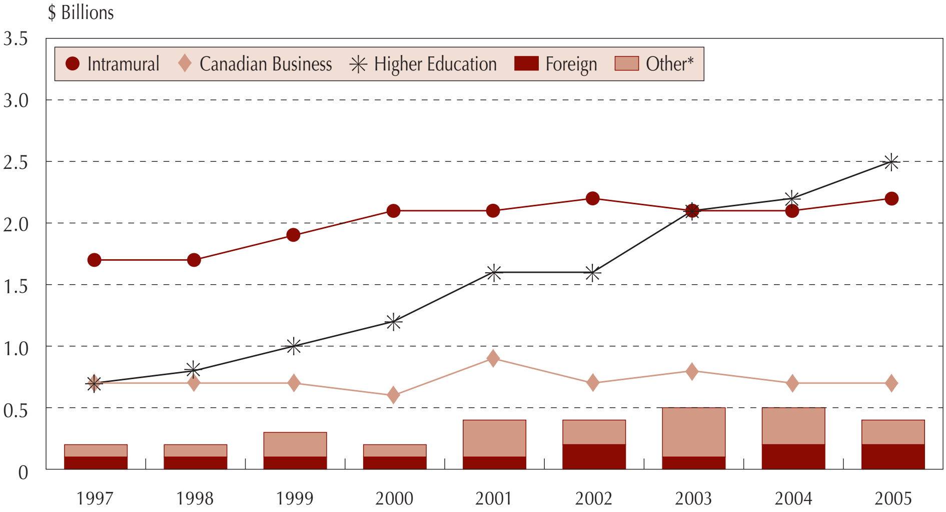
10 GOVERNMENT

The Government of Canada is the second most important funder of R&D in Canada, after the business sector. In 2005, the federal government funded 18 percent of the R&D performed in Canada. While this share has remained relatively stable over the past 10 years, the composition has shifted toward the higher-education sector.

The Government of Canada supports R&D and RSA through a number of departments and agencies. Some departments and agencies perform most of their R&D internally (NRC, NRCan), and others mainly provide research funds to universities (NSERC, CIHR, SSHRC, CFI) or to the business sector (IC).

These federal R&D dollars support a number of socio-economic objectives. R&D funding in Canada goes primarily to public health, industrial production, and non-oriented research (curiosity-driven research). Defence receives a smaller share in Canada than in the other G7 countries.

Federal R&D Expenditures by Performer Type, 1997 to 2005

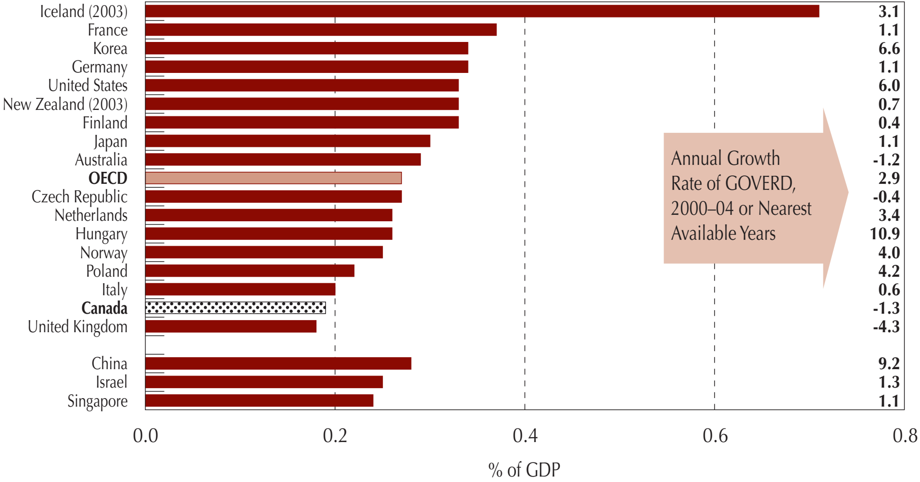


*Other includes private non-profit, provincial and municipal governments and other Canadian performers.

Source: Statistics Canada, *Science Statistics*, Vol. 30, No. 6, September 2006.

12

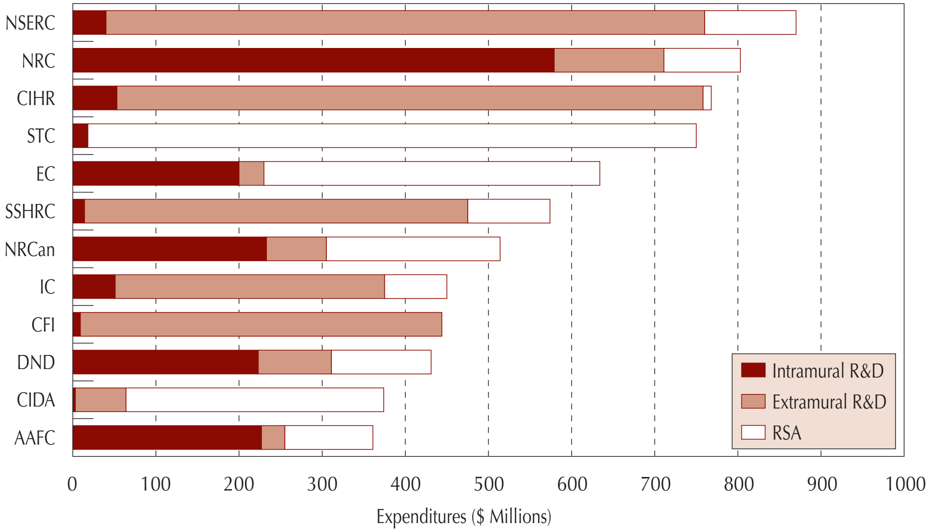
GOVERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2004



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

Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

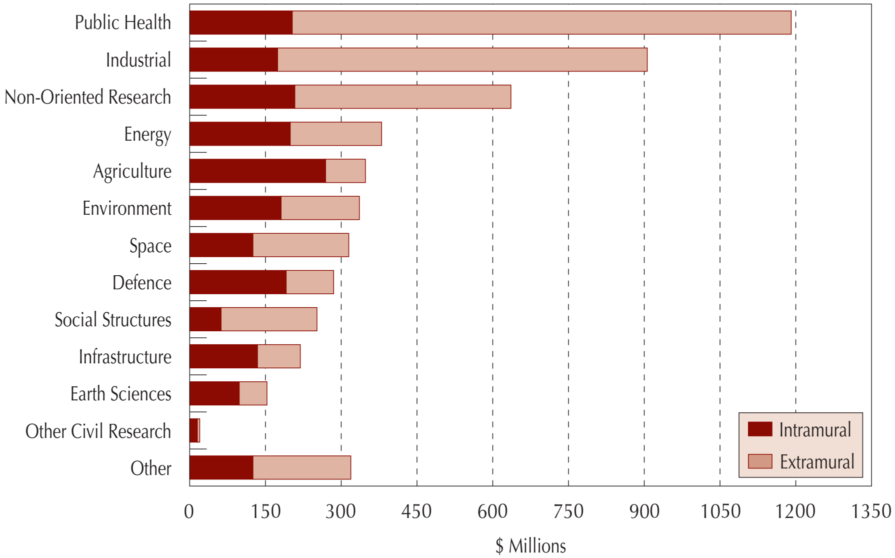
The Largest Federal S&T Departments and Agencies, 2005



Source: Statistics Canada, *2006–2007 Federal Science Expenditures and Personnel Survey*, Preliminary data, 2007.

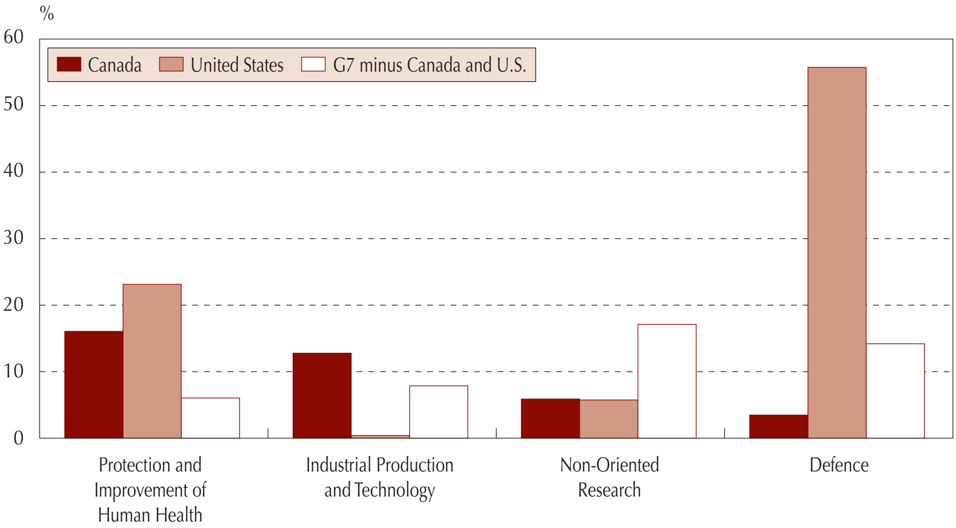
14

Federal R&D Expenditures by Socio-Economic Objective, 2004



Source: Statistics Canada, *Science Statistics*, Vol. 30, No. 6, September 2006.

Government R&D Expenditures by Selected Socio-Economic Objective, Canada, U.S. and Other G7 Countries, 2004



Source: OECD, *Research and Development Statistics*, 2005.

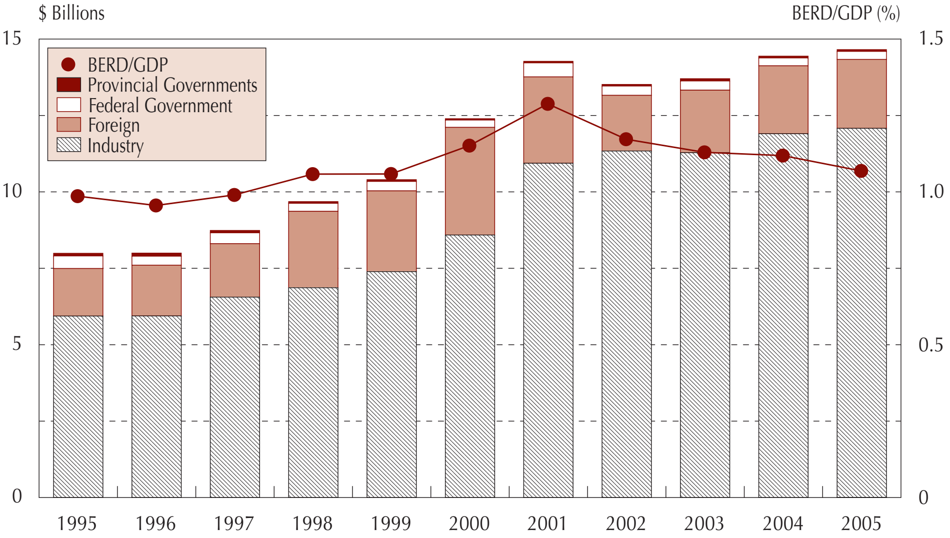
16 INDUSTRY

The business sector is the largest performer of R&D in Canada, and spent about $15 billion in 2005. After a sharp decline in 2002, business R&D recovered gradually and exceeded its 2001 peak in 2004 and 2005. Despite this growth, Canada's GDP grew at a faster pace, causing Canada's BERD intensity to decline slightly. In 2004, Canada ranked 14th in terms of its BERD-to-GDP ratio and was below the OECD average.

While most of Canada's BERD is financed by Canadian businesses, foreign sources are also an important source of funds. Over the last decade, foreign funding over GDP increased significantly in several countries, but it decreased slightly in Canada.

Governments also support business R&D, through both direct funding and tax incentives. Canada's overall support is similar to that of France and the United Kingdom, but relies much more on tax incentives than direct funding.

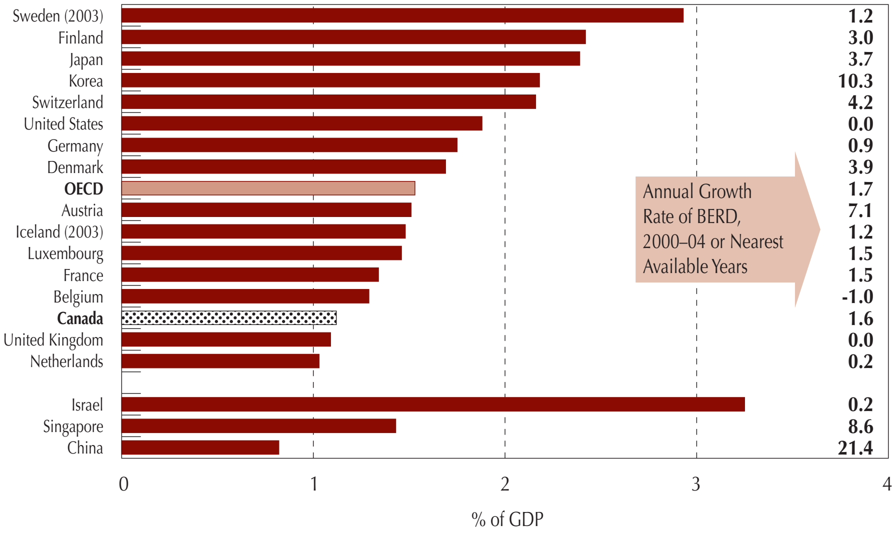
Canada's BERD by Major Source of Funds, 1995 to 2005



Source: Statistics Canada, *Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1995 to 2006, and by Province 1995 to 2004*, Cat. No. 88F0006XIE No. 009, September 2006.

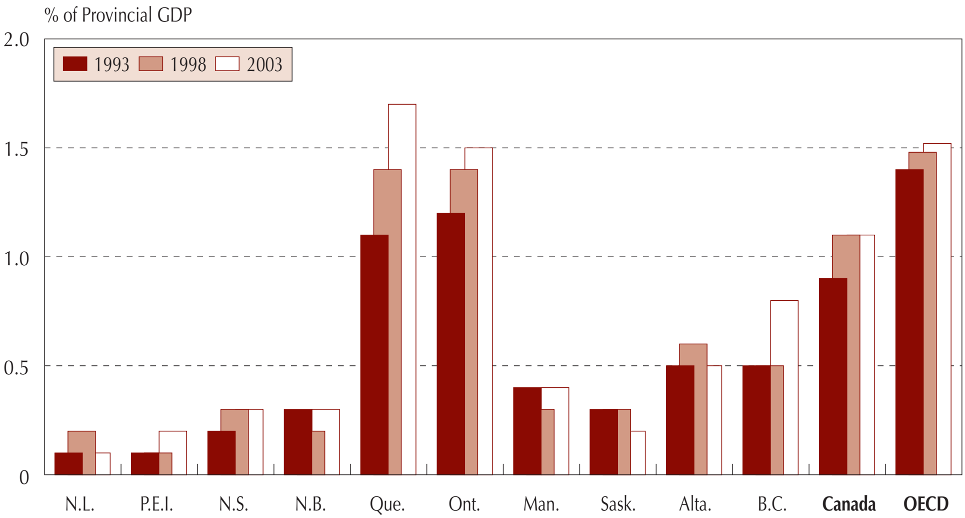
18

BERD as a Percentage of GDP, Top OECD Countries and Selected Non-OECD Countries, 2004



Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

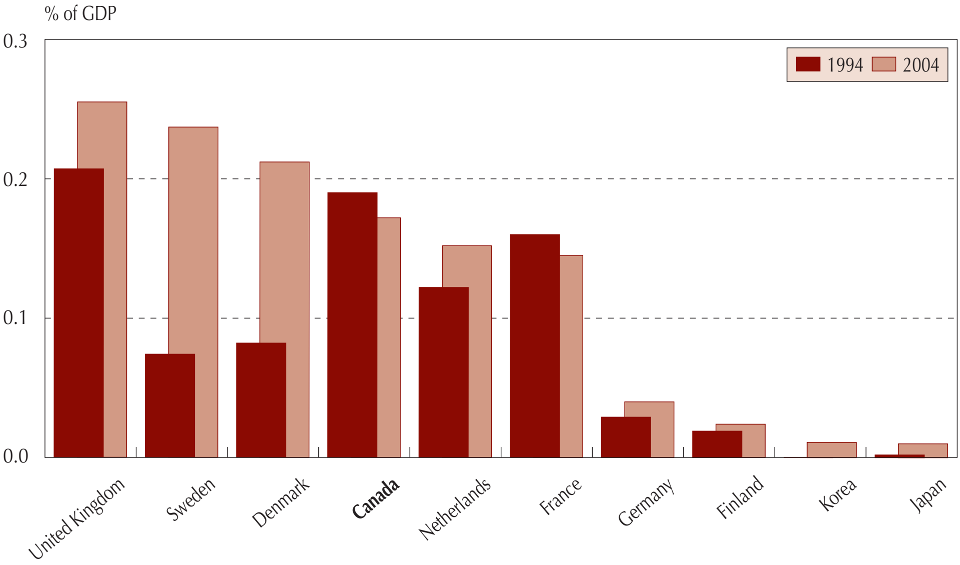
BERD Intensity at the Provincial Level, 1993, 1998 and 2003



Sources: Statistics Canada, *Science Statistics*, Vol. 30, No. 07, September 2006; *Canadian Economic Observer*, Cat. No. 11-210, 2005–06; and OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

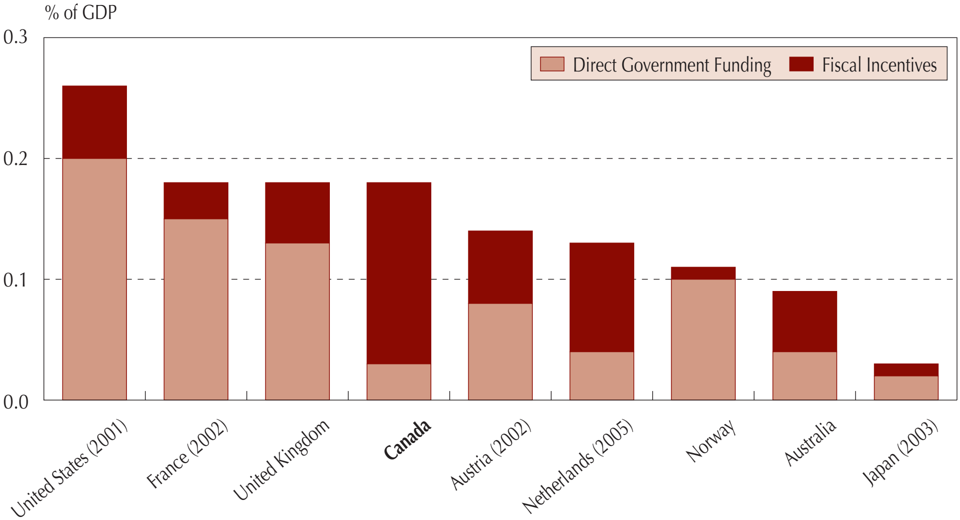
20

Foreign-Financed BERD as a Percentage of GDP, Selected OECD Countries, 1994 and 2004 (or Nearest Available Years)



Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

Direct Government Funding of Business R&D and Tax Incentives for R&D, Selected OECD Countries, 2004



Source: OECD, *Science, Technology and Industry Outlook 2006*, preliminary data.

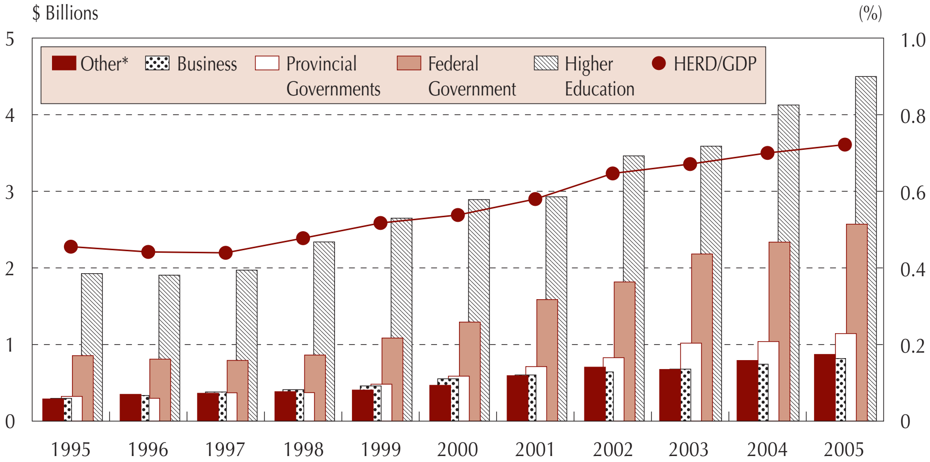
22 HIGHER EDUCATION

Over the past 10 years, Canada has devoted an increasing share of its resources to higher-education R&D, reaching $9.9 billion in 2005. Since 2000, Canadian HERD has grown at an annual rate of 9.4 percent, lifting Canada's HERD intensity to second place among OECD countries, just below that of Sweden.

From 1995 to 2004, the share of HERD by science fields stayed relatively constant, with natural and health sciences both at 40 percent and social sciences at 20 percent.

Higher-education institutions have also been training an increasing number of graduate students. In 2003, enrolment in graduate studies was about 25 percent higher than it was 10 years earlier. While management and public administration programs attracted more students at the master's degree level, physical and life sciences programs attracted more PhD students.

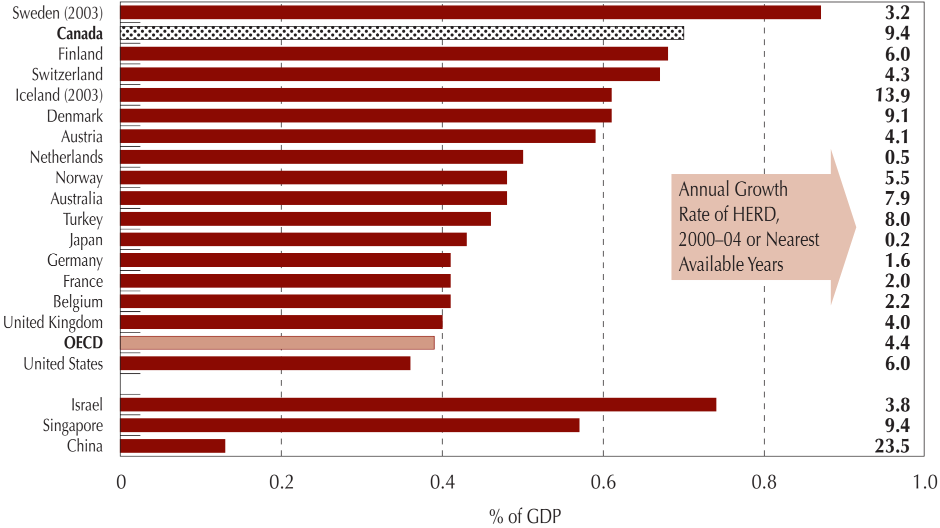
Canada's HERD by Major Source of Funds, 1995 to 2005



*Other includes foreign and private non-profit organizations.

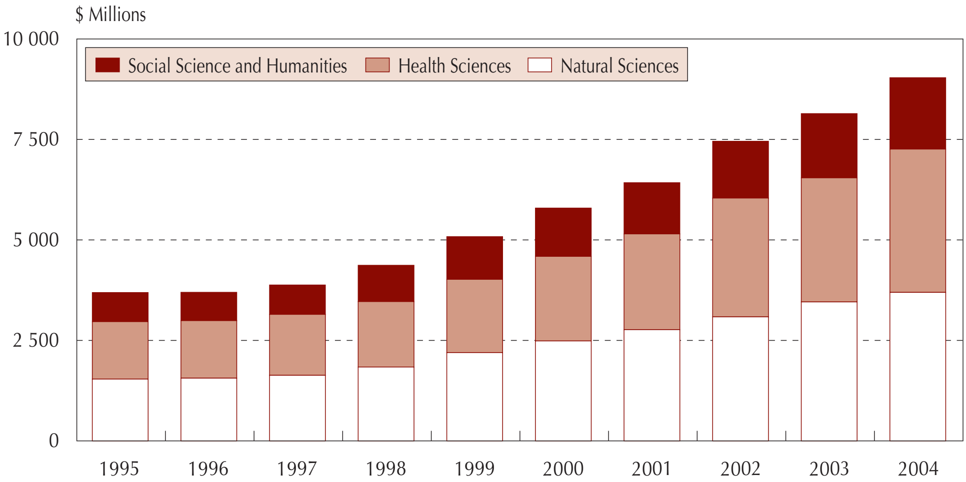
Source: Statistics Canada, *Estimates of Canadian Research and Development Expenditures (GERD), Canada, 1995 to 2006, and by Province 1995 to 2004*, Cat. No. 88F0006XIE No. 009, September 2006.

HERD as a Percentage of GDP, Top OECD and Selected Non-OECD Countries, 2004



Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

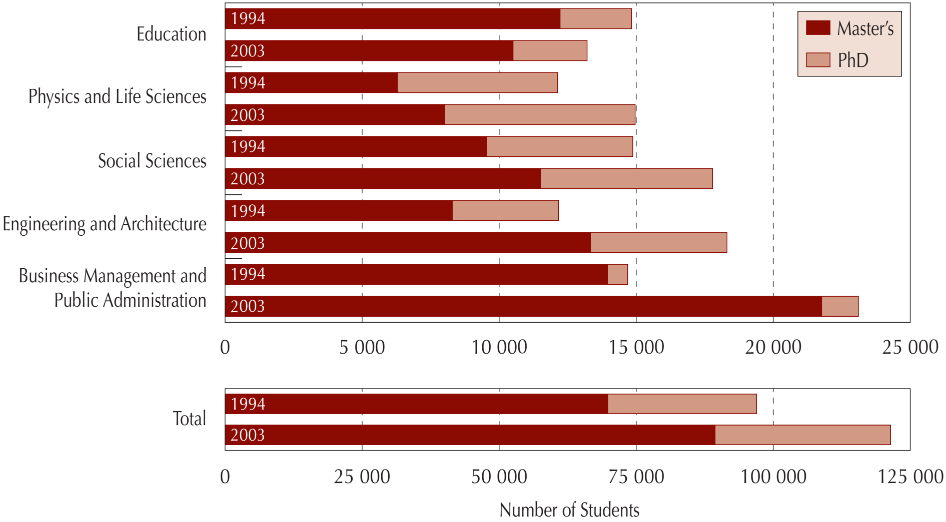
Higher Education Expenditures on R&D by Major Field of Science, 1995 to 2004



Note: Natural Sciences excludes Health Sciences.

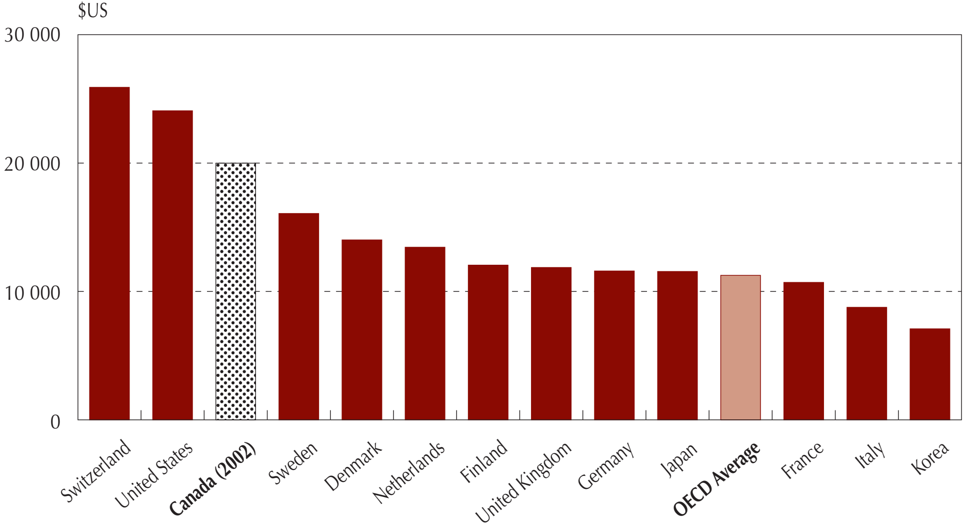
Source: Statistics Canada, *Science Statistics*, Vol. 30, No. 5, August 2006.

Total Graduate Enrolment and Top Five Disciplines, 1994 and 2003



Source: Jean Lebel, *Statistical Report 1994–2004*, Report for the Canadian Association for Graduate Studies, 2006.

Annual Expenditures on Tertiary Education per Student, Selected OECD Countries, 2003



Source: OECD, *Education at a Glance 2006*.

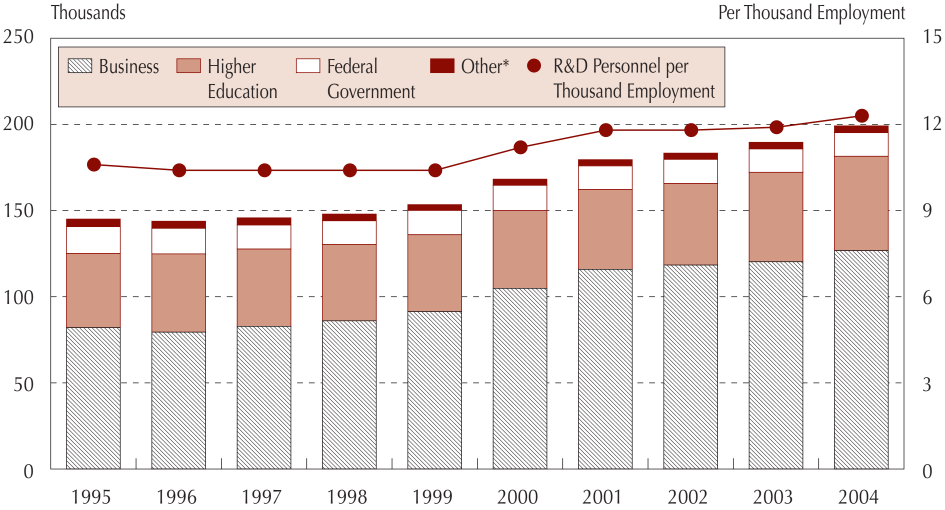
HUMAN RESOURCES

The ratio of R&D personnel to total employment is a measure of the extent to which a country devotes resources to developing new ideas and improving existing technologies. For Canada, this ratio remained constant during the 1990s, and has increased steadily since then. The increase came mainly from the business sector and universities.

Internationally, Canada has fewer R&D personnel, PhDs, and workers in science and technology occupations than most of its competitors. It is important to note, however, that although Canada has fewer technicians as a share of its total employment than most other leading countries, Canada ranks among the leaders for its share of professional workers.

The wage premium for workers with university degrees (over those without university degrees) is lower in Canada than in the United States and the United Kingdom, but higher than in other G7 countries and Scandinavian countries.

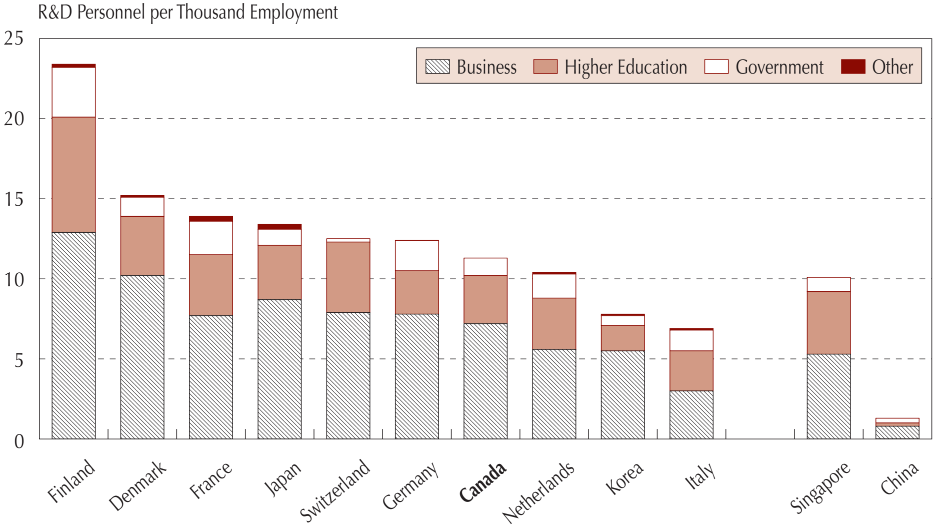
R&D Personnel by Sector of Performance, 1995 to 2004



*Other includes provincial governments and private non-profit organizations.

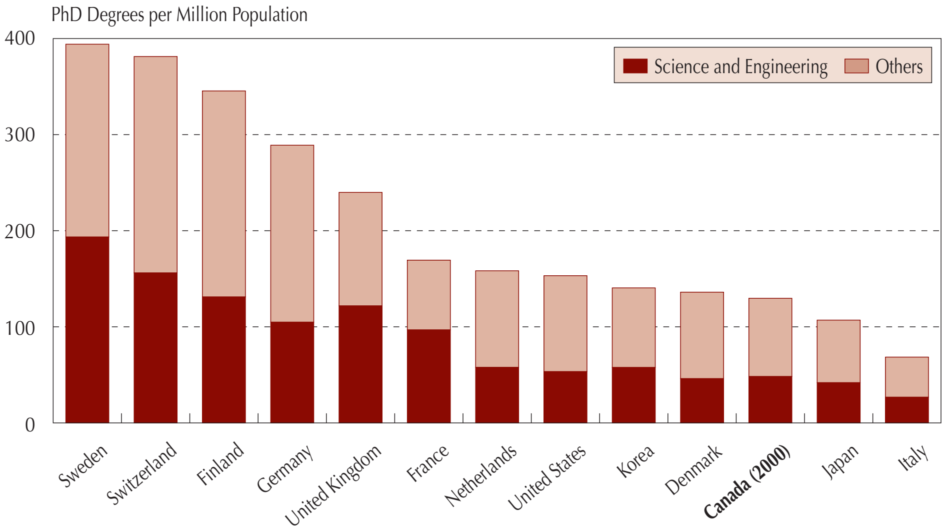
Source: Statistics Canada, *Science Statistics*, Vol. 31, No. 1, January 2007.

R&D Personnel per Thousand Employment, Selected OECD and Non-OECD Countries, 2002



Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

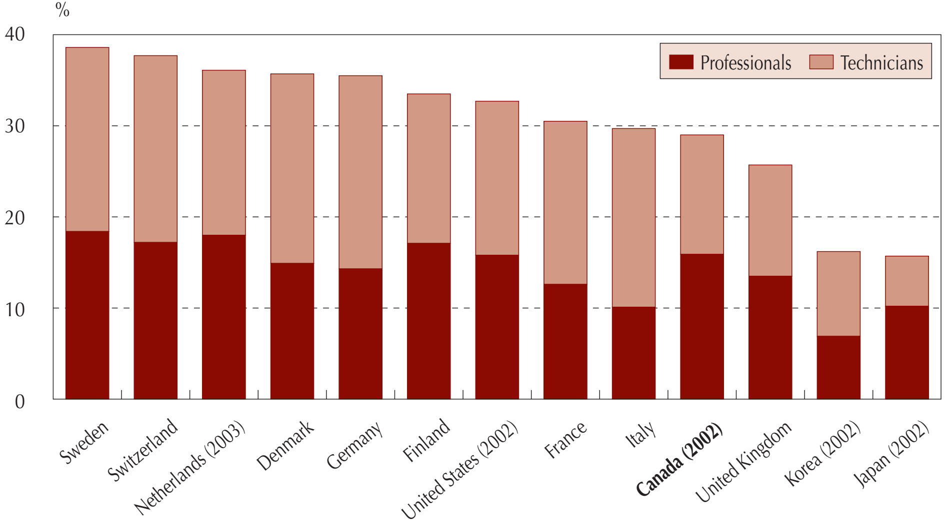
PhD Degrees per Million Population, Selected OECD Countries, 2002



Source: OECD, *Science, Technology and Industry Outlook 2006*.

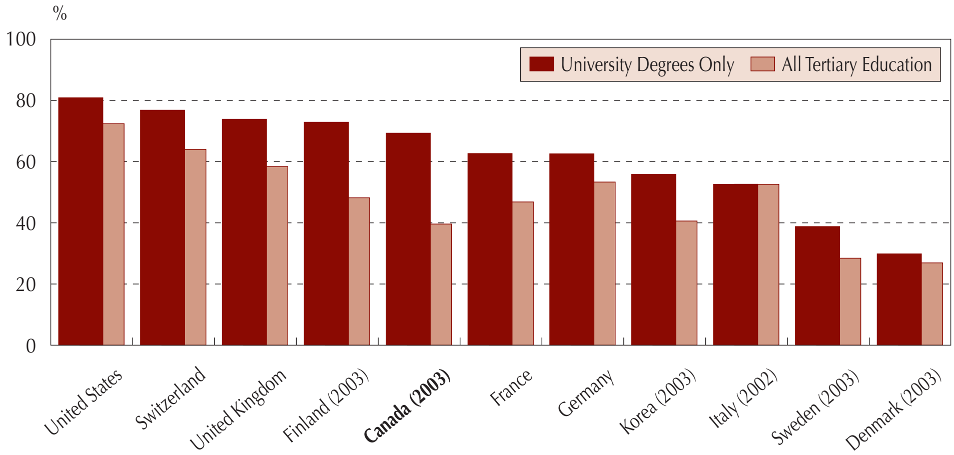
32

Human Resources in S&T Occupations as a Percentage of Total Employment, Selected OECD Countries, 2004



Source: OECD, *Science, Technology and Industry Outlook 2006.*

Wage Premium* Associated with Tertiary Degrees, Selected OECD Countries, 2004



*Relative to the earnings of individuals possessing upper secondary and post-secondary non-tertiary education.

Source: OECD, *Education at a Glance 2006.*

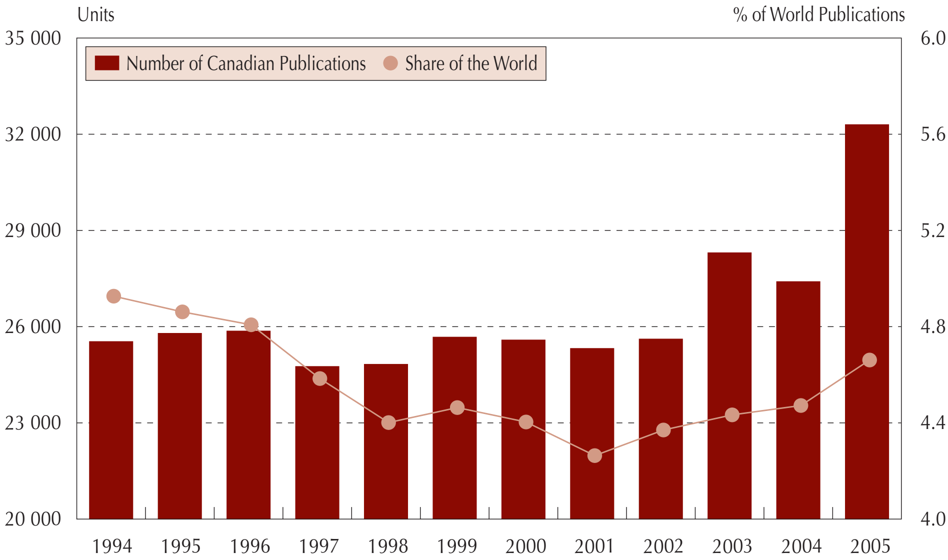
COMMERCIALIZATION AND OUTPUT

The number of Canadian articles published in scientific journals has recently increased, reaching a peak of 32 300 publications in 2005. Despite these gains, Canada's share of world publications has fallen because other countries such as China and Korea increased their output. When the quality or relative impact of these published papers is taken into account, Canada is still ahead of most OECD countries.

Patents are another standard indicator of scientific output. To account for quality, the OECD developed a measure called the "triadic patent," where an invention has to be filed in the Europe and Japan patent offices and granted in the United States. In Canada, the number of triadic patents generated by business R&D expenditures is low by international standards.

Canada's universities have shown steady increases in a number of output measures such as disclosures, patent applications and licences since 1998. Following an impressive jump from 1998 to 2001, commercialization income now stands 5 percent above the 2001 level.

Canadian Publications, 1994 to 2005

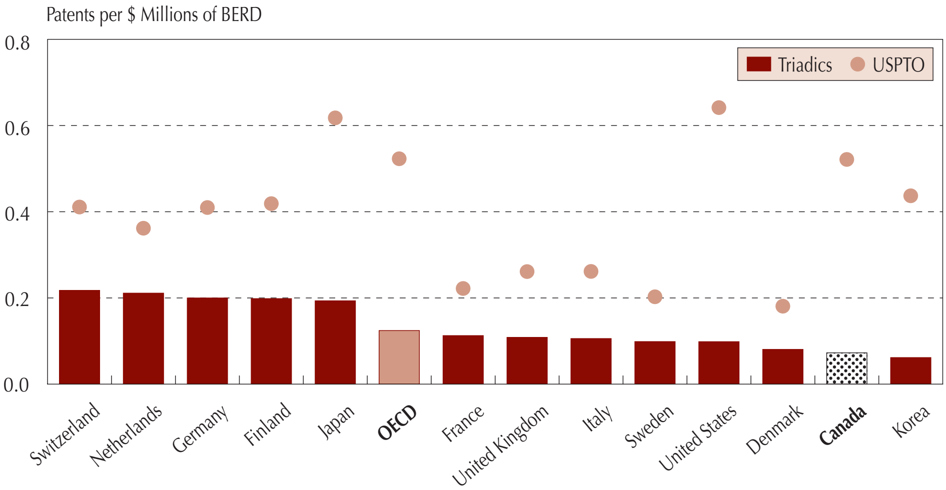


Source: Observatoire des sciences et des technologies, 2006.

Publication Intensity and Impact, Selected OECD and Non-OECD Countries, 2005

Source: Observatoire des sciences et des technologies, 2007.

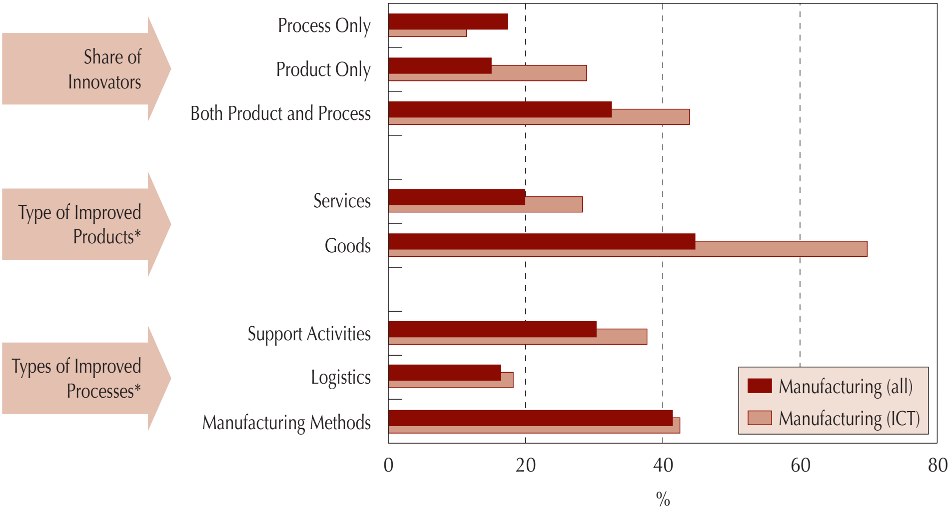
Patents per Million Dollars of BERD,* Selected OECD Countries, 2003



*A three-year lag was introduced, between BERD and patent counts, to take into account the delay between investments and patenting activity.

Source: OECD, *Main Science and Technology Indicators 2006/2*, December 2006.

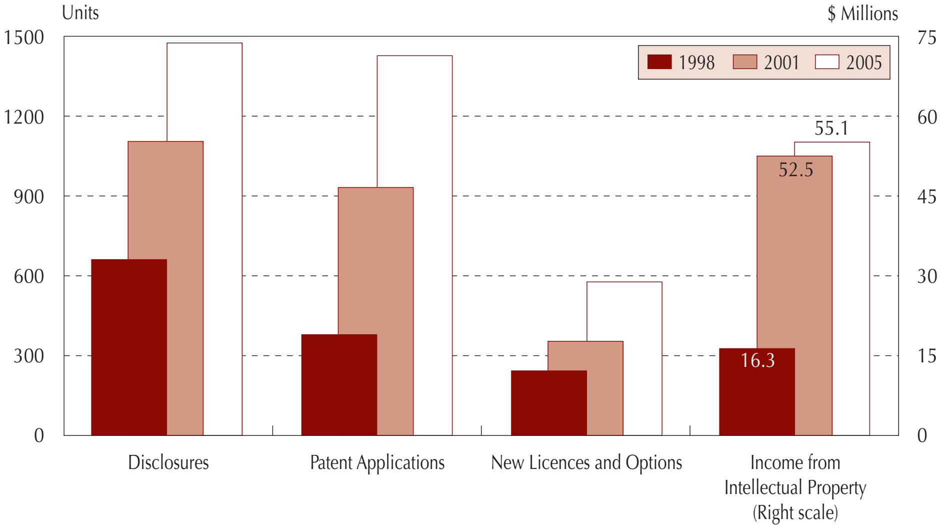
Share of Innovators by Type of Innovation, Manufacturing Industries, 2005



*Among product and process innovators respectively.

Source: Statistics Canada, *Survey of Innovation*, 2005.

Indicators of Some Commercialization Outputs of University Research, 1998, 2001 and 2005



Source: Statistics Canada, *Innovation Analysis Bulletin*, several years and CANSIM table 358-0025.

NOTES