



## Science & Technology across Canada *The State of Science and Technology in Canada, 2012*

### Overall

- Canadian science and technology is healthy and growing in both output and impact; there is high international regard for the quality and rigour of science and technology in Canada. While Canada as a whole excels in six key research fields, provinces have fields of particular *specialization*, often aligned with local economic strengths and local and regional clusters of innovation.
- Ontario, Quebec, British Columbia, and Alberta are the powerhouses of Canadian science and technology, together accounting for 97 per cent of total Canadian output in terms of research papers. These provinces also have the best performance in patent-related measures and the highest per capita numbers of doctoral students, accounting for more than 90 per cent of doctoral graduates in Canada in 2009.
- The geographic distribution of the six fields of strength is difficult to determine with precision because of the diminished reliability of data below the national level and the vastly different size of the research enterprise in each province. However, using average relative citations of research papers, a measure of impact that is independent of size, the Panel was able to develop the following regional breakdown:
  - *Clinical Medicine*: Ontario, Quebec, British Columbia, Alberta
  - *Historical Studies*: New Brunswick, Ontario, British Columbia
  - *Information and Communication Technologies*: British Columbia, Ontario
  - *Physics and Astronomy*: British Columbia, Alberta, Ontario, Quebec
  - *Psychology and Cognitive Sciences*: British Columbia, Nova Scotia, Ontario
  - *Visual and Performing Arts*: Quebec
- Collaboration is a critical component for science and technology. Ontario is the main hub of Canada's collaboration network, but smaller provinces and the territories have the highest collaboration rates. For example, Nunavut leads with a collaboration rate of 87 per cent (150 inter-provincial collaborations), which means that almost 9 out of every 10 papers from Nunavut are co-written with at least one researcher from another province or territory.

**Canada's Six Fields of S&T Strength**

1. *Clinical Medicine*
2. *Historical Studies*
3. *Information & Communication Technologies (ICT)*
4. *Physics & Astronomy*
5. *Psychology & Cognitive Sciences*
6. *Visual & Performing Arts*

### Atlantic Canada

- *Research output and impact:* Atlantic Canada produced 7 per cent of Canadian research papers in 2005-2010. The average relative citations in three of the four Atlantic provinces exceeds the world average with Nova Scotia at 1.17, Newfoundland and Labrador at 1.15 and New Brunswick at 1.02. The average relative citation of PEI matches the world average at 1.0.
- *Areas of specialization:* Prince Edward Island is specialized in agriculture, fisheries, and forestry, as is Newfoundland and Labrador; New Brunswick is strong in historical studies; Nova Scotia and Newfoundland and Labrador are also strong in earth and environmental sciences.

### Quebec

- *Research output and impact:* Quebec produced more than 88,000 research papers in the period 2005-2010, second only to Ontario. The impact of Quebec research was high, with average relative citations of research papers well above the world average.
- *Strengths:* Canada's research strengths are distributed across the four most research-intensive provinces, including Quebec; while important differences may exist at the sub-field level, they could not be established with certainty. However, of the six research fields where Canada excels, Quebec is active in clinical medicine, physics and astronomy, and visual and performing arts.

### Ontario

- *Research output and impact:* Ontario produced the largest number of research papers. The province produced more than 180,000 papers in 2005-2010, amounting to 46 per cent of Canada's bibliometric output. The impact of Canadian research, as measured by average relative citations is second only to British Columbia. Ontario is also the leading province for intellectual property, owning more than half of Canada's total number of patents in 2005-2010.
- *Strengths:* Canada's research strengths are distributed across the four most research-intensive provinces, including Ontario; while important differences may exist at the sub-field level, they could not be established with certainty. However, of the six research fields where Canada excels, Ontario is active in clinical medicine, historical studies, ICT, physics and astronomy, and psychology and cognitive sciences.

### Prairies

- *Research output and impact:* Manitoba and Saskatchewan each produce over 13,000 research papers per year. The average citation rates in both Manitoba (1.23) and Saskatchewan (1.13) both exceed the world average of 1.0.

- *Areas of Specialization:* Manitoba is active in biomedical research and also has a focus on agriculture, fisheries, and forestry. Saskatchewan is active in the fields of agriculture, fisheries and forestry in addition to biology.

### *Alberta*

- *Research output and impact:* Alberta produced 51,000 research papers in 2005 -2010. In terms of average relative citations, Alberta's research impact is high, behind Ontario, Quebec, and British Columbia.
- *Strengths:* Canada's research strengths are distributed across the four most research-intensive provinces, including Alberta; while important differences may exist at the sub-field level, they could not be established with certainty. However, of the six research fields where Canada excels, Alberta is active in clinical medicine, and physics and astronomy.

### *British Columbia*

- *Research output and impact:* British Columbia is the leading province in citation-related measures of impact. The province produced 60,000 research papers during the period of 2005-2010.
- *Strengths:* Canada's research strengths are distributed across the four most research-intensive provinces, including British Columbia; while important differences may exist at the sub-field level, they could not be established with certainty. However, of the six research fields where Canada excels, British Columbia is active in clinical medicine, historical studies, ICT, physics and astronomy, and psychology and cognitive sciences.

### **Report and related products:**

- [The State of Science and Technology in Canada, 2012 \(full report\)](#)
- [Executive Summary](#)
- [Report in Focus](#)
- [Appendices](#)
- [News Release](#)
- Media Primers
  - [Canada on the Global Stage](#)
  - [Science and Technology across Canada](#)
  - [Understanding the Expert Panel's Methodology](#)