Innovation and Canada's Ability to Compete Globally

Atlantic Leaders' Summit

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Government of Canada / Gouvernement du Canada

Introduction

Canada has an innovation and productivity challenge in a world oriented towards intense competition and a global technological race

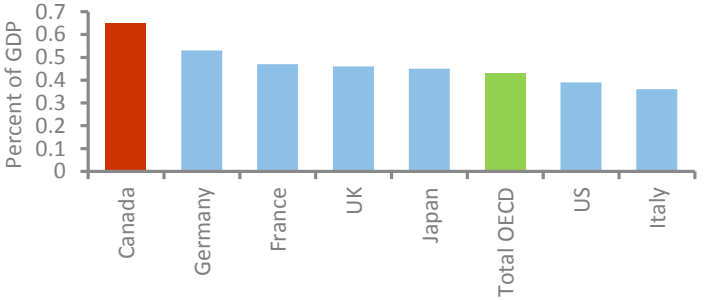
Innovation is not limited to R&D – It is also about adoption:

- It includes process, marketing and organization
- Typically non-linear (strong discovery research does not guarantee commercial innovation)
- It is path/sector dependent

Canada has strong science and technology capacity

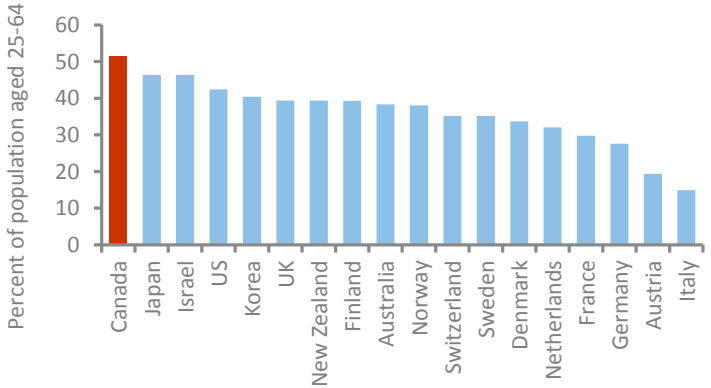
- Strong S&T capacity – knowledge and talent
  - Leads G7 for R&D spending in higher-education sector
  - Produces relatively more top-cited scientific articles than most industrialized countries
  - Net migration of researchers over the last decade
  - Highly skilled / educated workforce with highest share of university or college graduates among working-age population in the OECD
  - Robust growth in the number of science and engineering doctoral degrees in Canada (STIC 2012)
  - Young Canadians continuing to perform at the top tier globally with respect to reading, mathematics and problem-solving skills and science (PISA 2012)
- However, skills needed to innovate are growing in complexity, calling for a broader set of:
  - Soft, entrepreneurial and managerial skills
  - Skills sets in demand for big data and disruptive technologies

Higher education expenditures on research and development, G7 countries, 2012



Source: OECD, Main Science and Technology Indicators 2014-1, June

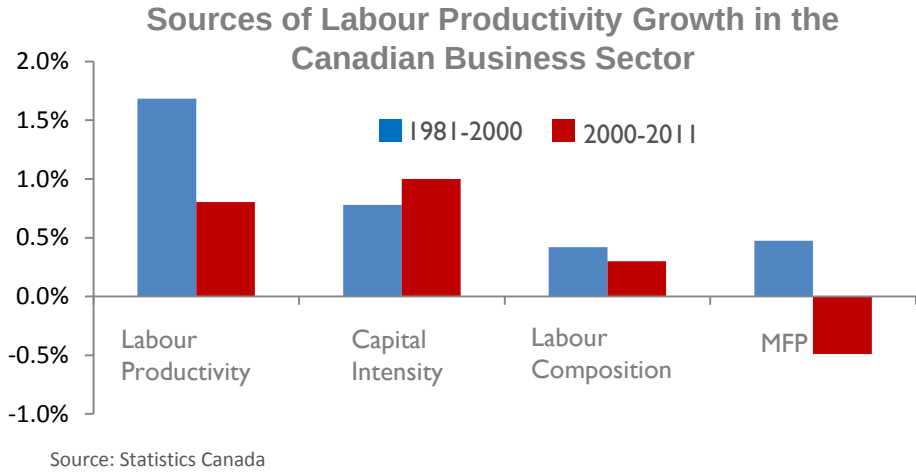
Percent of population having attained a tertiary education, selected OECD countries, 2011



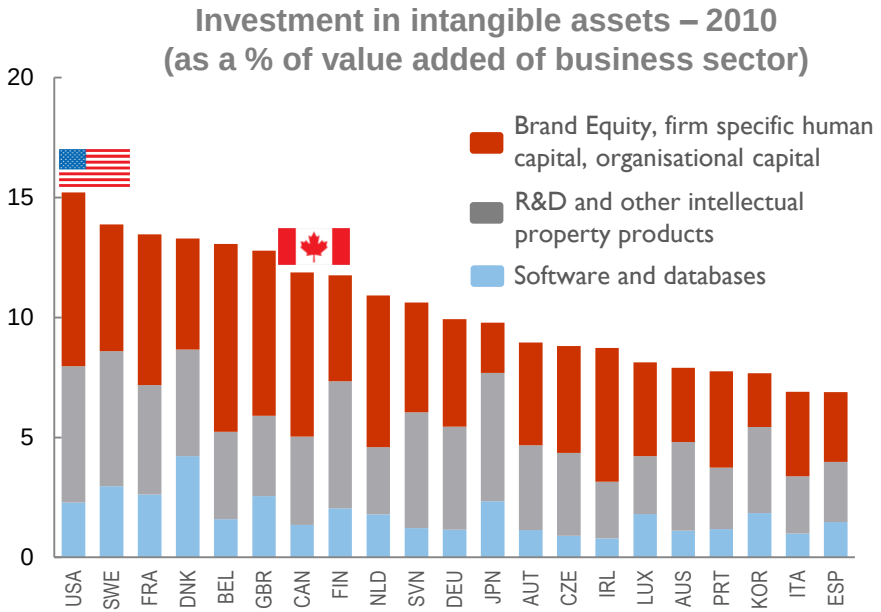
Note: For Canada, Tertiary-education refers to college or university level
Source: OECD, Education at a glance, 2013

Canada's weak productivity and subpar innovation performance limit future growth prospects

- Canada's labour productivity growth ranks 28th among 35 comparator countries
- Productivity growth slowdown linked to weakness in multifactor productivity (MFP)
- Canada ranked 22nd among OECD countries for business expenditure on R&D intensity
- Canadian business landscape faces issues beyond R&D
  - Lack of management capacity & serial entrepreneurs
  - Lack of anchor firms around innovation hubs
  - Few business strategies focussed on innovation/growth
  - Large component of small less productive firms
  - Challenge in accessing new markets
  - Limited access/scale of venture capital
  - Risk averse culture



Source: Statistics Canada



Source: OECD

Risks of not keeping up with competitors are clear

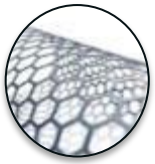
What are the stakes in the global innovation race?

- Loss of significant new market opportunities and economic potential
- Reduced attractiveness as an investment destination for value added activities
- Further erosion of manufacturing base
- Failure to recoup investment in public R&D
- Technology takers will not capture the high-value parts of GVCs
- Leaders will shape how disruptive technologies address health, environmental and societal challenges, and the rules of the game – those who follow will have no say

Disruptive Technologies

Haptic & Wearable Electronics: $15B by 2015

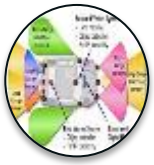
Big Data: $41.5 B by 2018



Nanotechnology: $3.2T by 2018

Energy Storage: $50B by 2020

Additive Manufacturing (parts): $48B by 2025

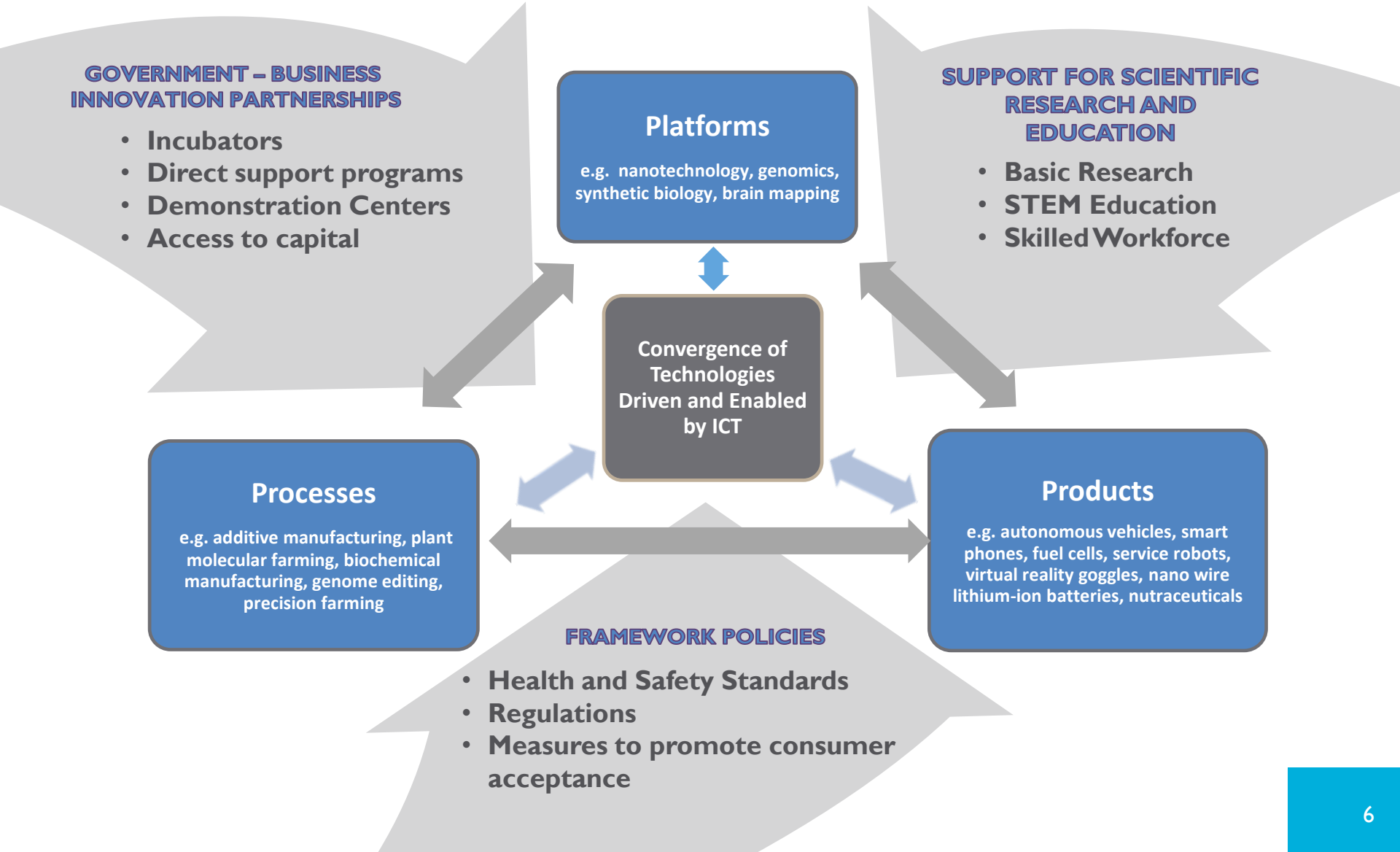


Autonomous Vehicles: $87B by 2030

Source: Lux Research, IDC

From an 'economic potential' perspective, McKinsey Consulting estimates that by 2025, the economic impact of additive manufacturing will range between $200B - $600B and energy storage between $100B - $600B

Disruptive technologies multi-faceted, presenting an array of opportunities for Canada



Taking Stock of the Innovation Agenda

- We have done many things right but the results for innovation remain disappointing
- Canada has taken steps to get the macroeconomic framework right:
    - Lowest corporate tax rates in the G-7
    - Changes to SR&ED
    - Generally opted for indirect and passive support
- Even more remains to be done in the microeconomic agenda building on the Jenkins Panel:
    - $400M in Venture Capital funding
    - Transformation of NRC and programming to encourage greater demand from business
    - Investments in incubators and start-ups
    - Introduced programming with intermediary organizations such as Business-led Networks of Centres of Excellence (BL-NCE), Centres of Excellence for Commercialization and Research (CECR).
    - Canada First Research Excellence Fund (CFREF) and Canada Excellence Research Chairs (CERC)
- Renewal of Science, Technology and Innovation Strategy (2014)
    - New dimensions of advanced manufacturing / open science

Being Bolder / Getting Better Results

- Focus on five core elements: (1) people, (2) framework conditions, (3) policies to create and apply knowledge, (4) innovation for global and social challenges, and (5) governance and measurement.

- Do we treat innovation too much as "as one thing"?
    - Differences in scope, timing and excellence in different sectors (eg. ICT vs health)

- How do we make Canada's R&D/innovation ecosystems more risk-taking and entrepreneurial? Able to accept failure and excellence?

- Should we move our system further from indirect, passive to direct? Where and how?

- How do we promote more multidisciplinary teams? Link better "entrepreneurship and creativity"?

- How do we align better the roles of government, universities and business? What are the roles of each, especially in dealing with disruptive technologies?
    - How de we do a better job of connecting the research and business worlds?
    - How do we give youth more experiential learning (eg. Co-ops) to allow talent to grow and lead innovation?
    - How do we avoid a culture of complacency and promote excellence?

Annex: Competitors not standing idle – positioning to win technological race

U.S. vision: "Capturing Domestic Competitive Advantage in Advanced Manufacturing" *President's Council of Advisors on Science and Technology; Innovation Strategy (2009)*

U.S. approach: The US is betting across the board, through MNE partnerships, federal investments and mission-oriented procurement

Big Data – Performing well on adoption and growth of the industry. Open data portal to access data

German vision: "Ensure that ideas are turned into marketable products as quickly as possible and that successful companies can set new standards for global markets."
High Tech Strategy 2020 for Germany

German approach: Germany is leading a reinvention of manufacturing—*Industry 4.0*—with a pragmatic focus on platform and product, supported by extensive networks

UK vision: Develop a "high tech industrial strategy [addressing] the missing pillar to any successful high tech strategy, that is technology and engineering as distinct from pure science."
David Willetts, Minister for Business, Innovation & Skills, 2012

UK approach: The UK is making a concerted shift, after an in-depth consultative process, from research to application, focusing on areas it thinks it is competitive.

Big Data – Strategy in 2013 aims to foster adoption of big data by private sector and government

China: 12th Five Year Plan (2010) prioritizes seven "Strategic Emerging Industries"

- Biotechnology; Industrialization Platforms for Aerospace; New Materials (including nanotechnology); Next-generation IT; Alternative Energy; Clean Energy Vehicles; Energy Conservation

Goal: to increase the GDP share of high-technology to 20 percent by 2020

- Central Government Budget 2014 – $43.6B for S&T; $8.1B devoted to 16 megaprojects emphasizing engineering and applied research

Brazil: National Strategy in Science, Technology and Innovation

- $37.5B for 2012-2015 period
- ICT, nanotechnology, materials ($248M towards ICT)

Israel: Technological Incubators Program

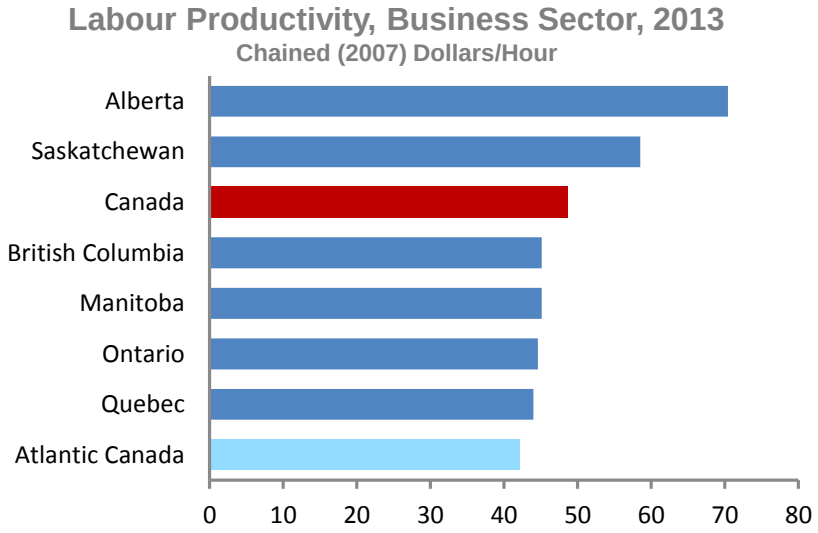
- $730M since 1991 + $4B private investments
- Includes medical devices, biotechnology, pharmaceuticals, clean-tech and ICT

Annex: Canada's Federal Policy Mix – Where We Stand

- Since 2007 strategy release:
  - Ongoing support to HERD (approx. $3B/yr). Recently announced resources ($1.5B/10yrs CFREF) through competition-based program with a focus on global research excellence represents long term commitment.
  - Successful introduction or expansion of business R&D programming (e.g., IRAP, procurement, venture capital), including business intermediaries (e.g., CAIP, BL-NCE).
  - Much programming (e.g., APC, CAIP) require leveraged funds (to encourage partnerships) or makes partnership a requirement (e.g., TDP in particular, but also BL-NCE, IRAP vouchers).
  - On disruptive technologies, clear strength in platform (genomics, nanotechnology, quantum, energy storage).
- Government response to Jenkins measures are recent and are expected to have an impact in the medium-term:
  - Shift in tax benefits re-invested in direct support targeting SMEs.
  - Trade agreements expected to have largest impact over time, once finalized
  - Program consolidation: Mitacs as single delivery agent of federal support for postdoctoral industrial R&D fellowships; new NRC Concierge Service expected to address awareness and access issues.
- Moving Forward in Science, Technology and Innovation 2014
  - Builds on the 2007 framework and updates research priorities:
    - Expands Environment priority to include Agriculture, reflecting key research areas in sustainable renewable resource development
    - Adds Advanced Manufacturing as a priority, reflecting opportunities in that sector
  - Revises Pillars:
    - People: Expand to include youth, students, researchers and entrepreneurs
    - Knowledge: Highlight commitment to world-leading research and major new investments since 2006
    - Innovation: New pillar to emphasize commitment to jobs, new technologies and Canada's challenges in innovation and productivity
  - Reduces administrative burden on researchers, while ensuring accountability
  - Fosters open government approaches
- Skills development:
  - Enhanced support through internships and fellowships
  - Science culture has not been a strong focus and outlook is not positive.
  - Business innovation culture has also not been a focus and increasingly pointed to as a 'root cause' of low productivity

Annex: Atlantic Canada recorded a decline in business sector productivity in recent years

- In 2013, Atlantic Canada lagged behind all other provinces in terms of business sector labour productivity.
  - Newfoundland and Labrador increased Atlantic Canada's average productivity, as New Brunswick (36.0), Nova Scotia (35.4), and PEI (28.2) were well behind the other provinces.
  - It should be noted that Newfoundland and Labrador (69.9) actually ranked just behind Alberta (70.4).
- Atlantic Canada appears to have been strongly impacted by the recent financial crisis in 2008.
  - It was well above the national average in terms of labour productivity growth prior to 2000 and actually led all provinces during 2000 – 2010.
  - During 2010 – 2013, Atlantic Canada was the only region/province to post a decline in labour productivity



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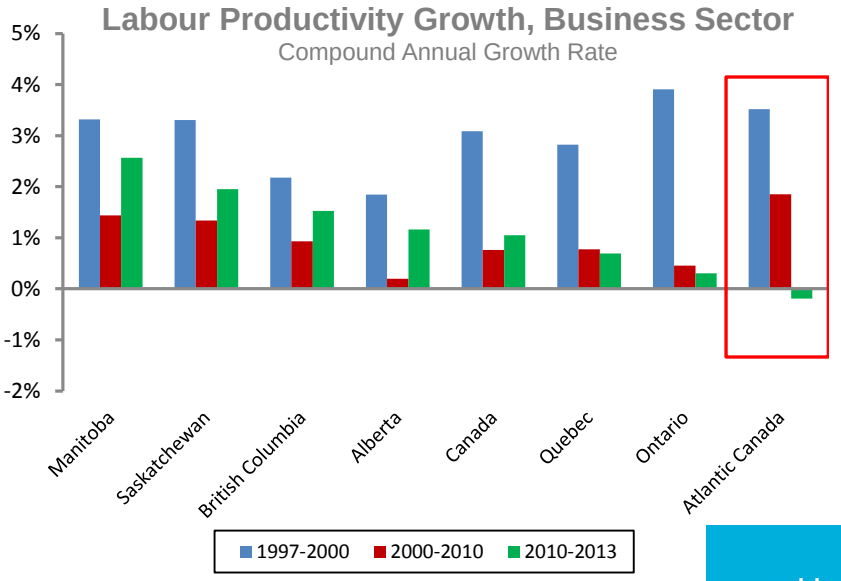


Source: Statistics Canada

Annex: Atlantic Canada's business sector invests relatively little in R&D, and companies in the region tend not to use advanced technologies

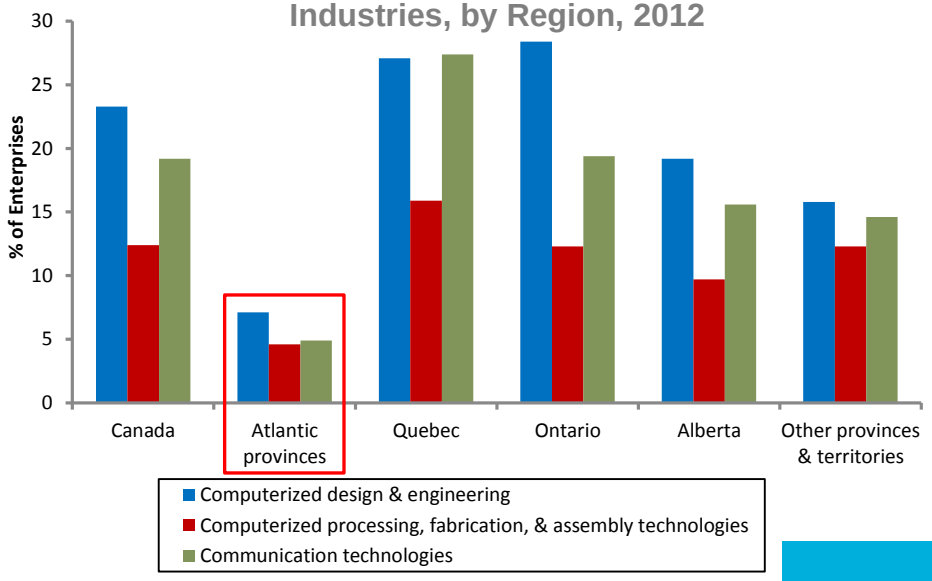
- Atlantic Canada's higher education institutions performed very well in terms of R&D performance.
  - The region trailed only Quebec (0.86) and Ontario (0.75); however, Nova Scotia (0.98) actually led all provinces while Newfoundland and Labrador (0.78) ranked third in the country.
- Atlantic Canada did very poorly in terms of business expenditures on R&D, ranking only ahead of Saskatchewan (0.24).
  - Nova Scotia (0.21) was the lowest in Canada, just behind New Brunswick (0.22).
- Companies in Atlantic Canada lagged their counterparts in other regions of the country in advanced technology use.
  - The proportion of enterprises in Atlantic Canada that reported using advanced technologies were well below those in other provinces for three types of advanced technologies examined.

R&D Investment as a Share of GDP, by Performing Sectors, 2012

	GDP	GERD	BERD	HERD
	$Millions	% of GDP	% of GDP	% of GDP
Canada	$ 1,831,228	1.71	0.88	0.66
Atlantic Canada	$ 107,844	1.10	0.25	0.75
Quebec	$ 357,431	2.27	1.31	0.86
Ontario	$ 679,616	2.09	1.07	0.75
Manitoba	$ 59,126	1.11	0.36	0.55
Saskatchewan	$ 78,873	0.73	0.24	0.35
Alberta	$ 315,803	1.09	0.62	0.40
British Columbia	$ 222,565	1.32	0.70	0.57

Source: Statistics Canada

Use of Advanced Technologies, All Surveyed Industries, by Region, 2012



Source: Survey of Innovation and Business Strategy (SIBS), 2012