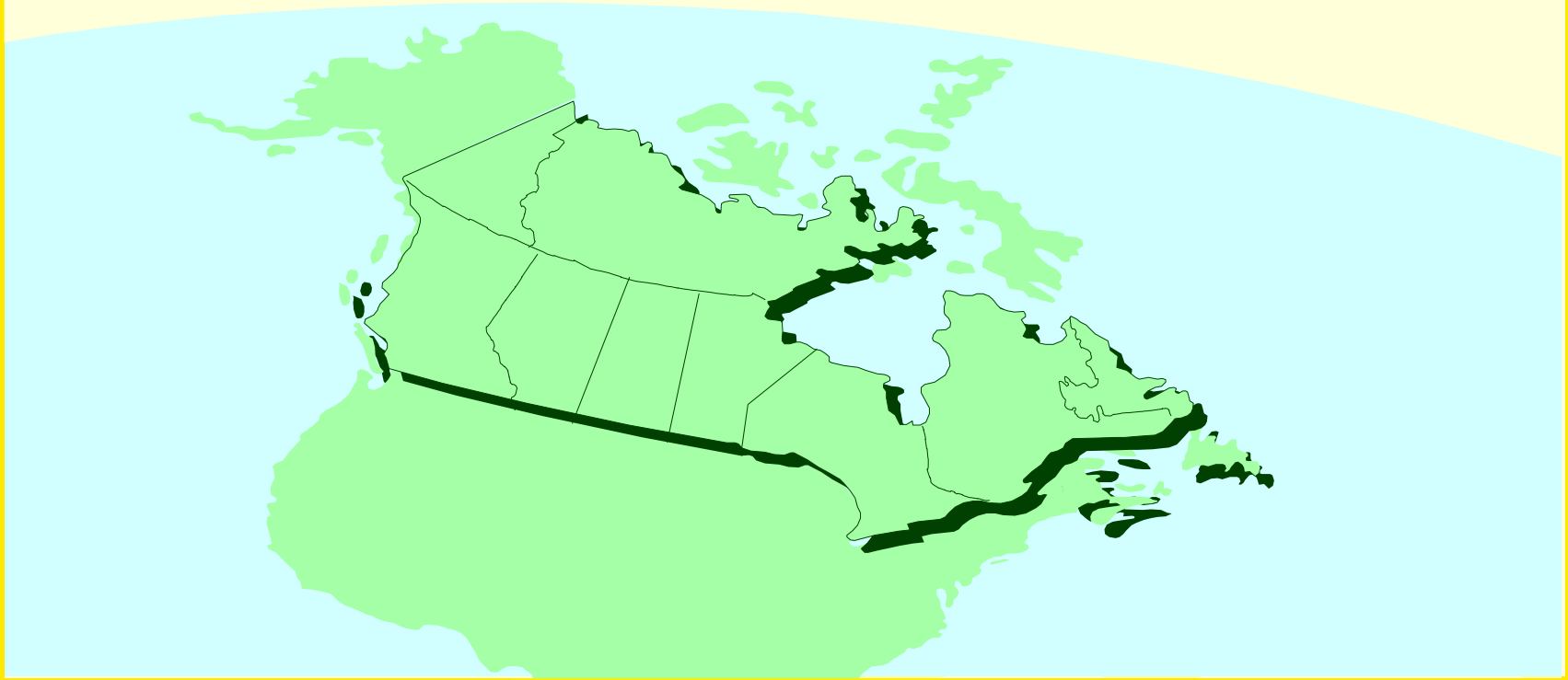
Canada's Regions and the Knowledge-Based Economy

A Compelling Journey to a Promising Future



Introduction

Canada is well poised to take advantage of the emerging opportunities brought about by the knowledge-based economy (KBE). We have a first-class technological infrastructure and a strong technological environment — indeed, by some measures, Canada has the best combination of infrastructure and people in the world!

However, focusing only on the national scene can give an incomplete picture. How are our individual regions faring? Are they equally well positioned to benefit from the new economy? And what are the strengths and weaknesses of individual regions?

These are important questions, and Canada's successful transition into a first-class KBE will ultimately depend on the progress of our regions. In that vein, this report shows how individual regions are preparing for future growth by assessing their KBE readiness.

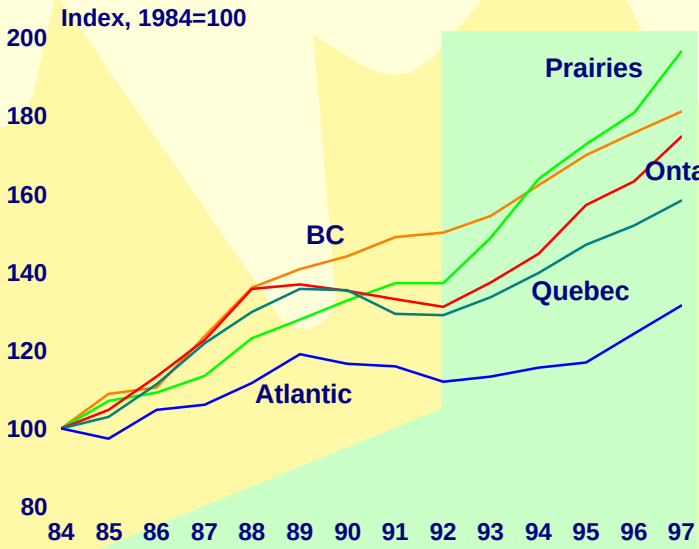
A Compelling Journey to a Promising Future

While all regions are focusing more on the KBE...

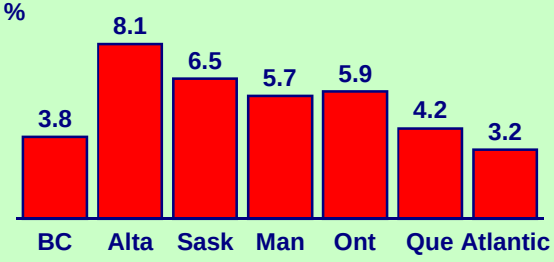
High-knowledge activity is increasing in all regions, albeit at different speeds.

- **The high-knowledge sector in the Prairies and Ontario has been growing particularly fast in recent years.**

High-Knowledge* Output Growth



Average Annual Growth, 1992-1997



* For a discussion of the high-knowledge industrial classification, see the Annex.

Source: Industry Canada calculations based on Statistics Canada data

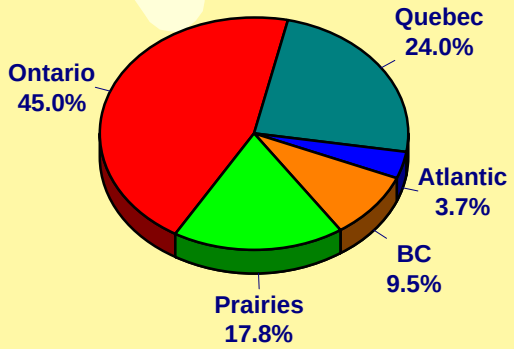
...high-knowledge activity is still largely concentrated in Ontario...

Ontario accounts for nearly half of all high-knowledge output in Canada, followed by Quebec which contributes about a quarter.

Central Canada's high proportion of KBE activity reflects its industrial structure.

- **Manufacturing and Business Services sectors represent the lion's share of the high-knowledge industries, and these are concentrated in Central Canada.**

Share of High-Knowledge Activity*, 1997



* Based on Real GDP at factor cost.
Source: Industry Canada calculations based on data from Statistics Canada

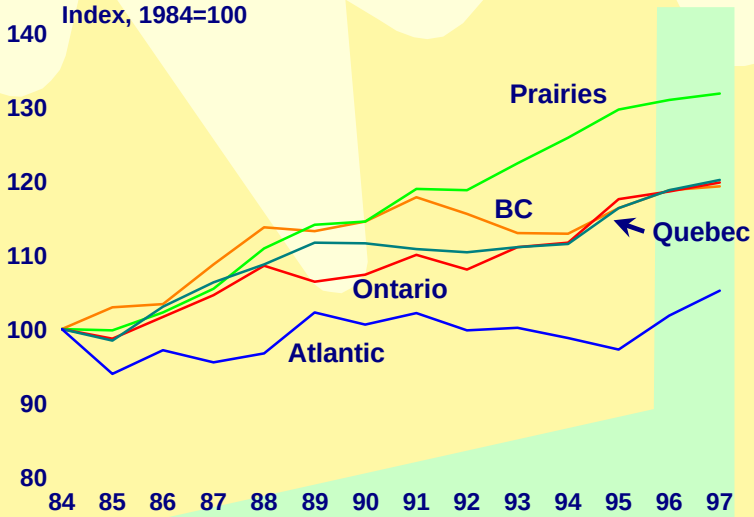
...and knowledge intensity is increasing most rapidly in the Prairies

The amount of high-knowledge activity as a share of total economic activity is rising across all regions.

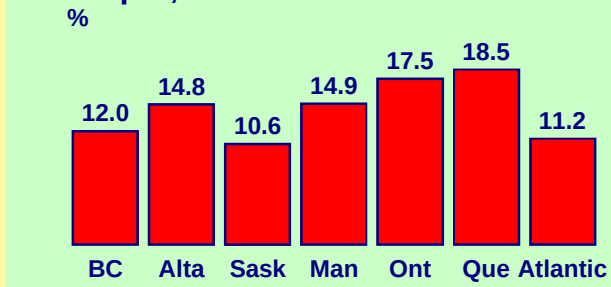
However, gains are especially strong in the Prairie provinces.

The importance of the KBE sector in provincial economic activity is highest in Central Canada, followed by Manitoba and Alberta.

High-Knowledge Share of Business Output



High-Knowledge Share of Business Output, 1997



Source: Industry Canada calculations based on data from Statistics Canada

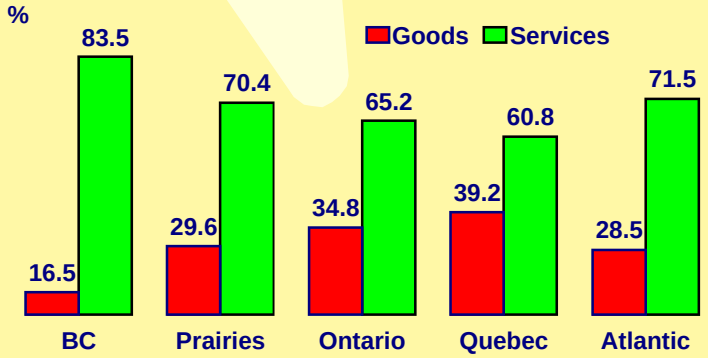
The KBE is more balanced among Goods and Services in Central Canada...

The composition of the KBE differs across regions. Central Canada's knowledge economy is more balanced between the goods and services sectors.

- **Goods-producing industries account for more than a third of total knowledge employment.**

In western provinces, particularly BC, and Atlantic Canada, the knowledge economy is concentrated in the Services sector — with over seven out of ten jobs.

Knowledge* Employment Shares, 1997



* Knowledge employment is defined as employment in high-knowledge industries. High-knowledge industries are listed in the Annex.
Source: Industry Canada calculations based on Statistics Canada data

...but the top knowledge industries are quite similar across regions

The shape of knowledge activity within the Goods and the Services sectors does not vary significantly across regions.

In the Services sector, the top four knowledge industries are the same across regions.

- **Of these, Other Business Services accounts for more than 30% of all knowledge employment. Engineering, Computer and Management Services round out the top 4 industries.**

Major goods-producing knowledge industries are Pharmaceuticals, Electrical Power, Machinery and Communications Products. Aircrafts and Parts manufacturing is important in Quebec and Atlantic Canada.

Top Knowledge* Industries, 1997

	BC	Prairies	Ontario	Quebec	Atlantic
Goods:					
Pharmaceuticals	✓	✓	✓	✓	✓
Electrical Power	✓	✓	✓	✓	✓
Machinery	✓	✓	✓		✓
Communications Products	✓	✓	✓	✓	
Aircrafts & Parts				✓	✓
Services:					
Other Business Services**	✓	✓	✓	✓	✓
Engineering Services	✓	✓	✓	✓	✓
Computer Services	✓	✓	✓	✓	✓
Management Services	✓	✓	✓	✓	✓

* Knowledge employment is defined as employment in high-knowledge industries; Top four industries in the Goods and Services sectors

** Other Business Services include: Employment Agencies & Personnel Suppliers, Accounting & Bookkeeping Services, Advertising Services, Office of Lawyers and Notaries and Other Business Services.

Source: Industry Canada calculations based on Statistics Canada data

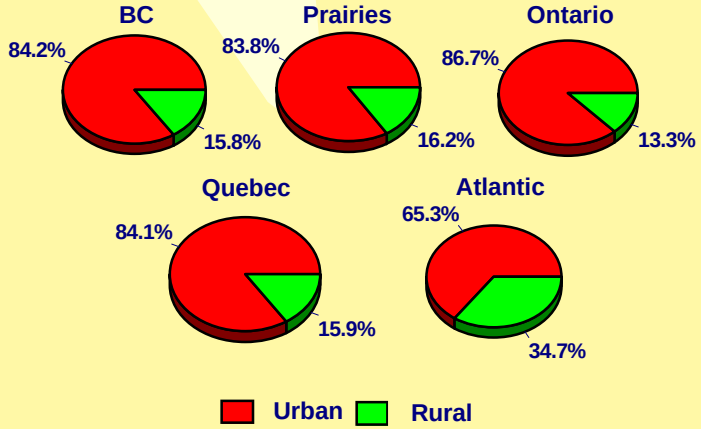
The KBE remains essentially an urban phenomenon

High-knowledge activity is largely concentrated in urban areas across all regions.

- **From BC to Quebec, more than eight high-knowledge jobs out of ten occur in urban centres.**

- **In Atlantic Canada, the region with the highest proportion of rural workers, knowledge activity is concentrated in urban areas — with two-thirds of all high-knowledge jobs.**

Urban and Rural Shares* of High-Knowledge Employment, 1997



* Urban share of high-knowledge employment refers to the share of total high-knowledge employment found in Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs) with more than 20,000 population. Rural share of high-knowledge employment refers to the share of high-knowledge employment found outside these areas.

Source: Industry Canada calculations based on Statistics Canada data

How are Regions Adjusting to the KBE?

What does it take to succeed in the KBE?

Strong economic fundamentals, a skilled and innovative workforce and an appropriately large technological infrastructure are key to success in the new economy.

The next section will examine how the regions in Canada are faring in terms of their "readiness" for future growth in the KBE.

- ☑ **Proper macro fundamentals**
- ☑ **A skilled workforce**
- ☑ **An outward orientation**
- ☑ **An innovation culture**
- ☑ **Information and communications infrastructure**

The economic climate is favourable across regions...

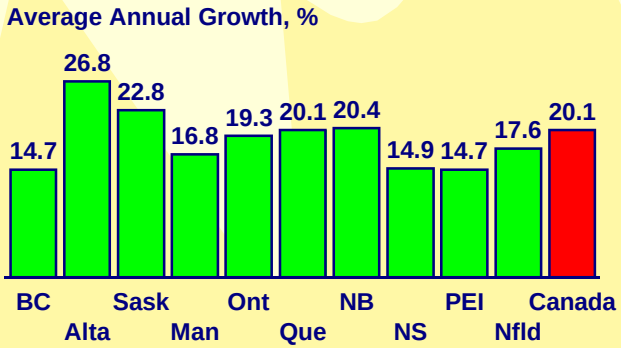
Strong profits and sustained economic growth are key elements for increased investment and a flourishing KBE.

- **Corporate profits have been particularly strong over the 1992-1997 period.**

- **All regions should post sustained growth this year and next, with the exception of BC — which should soon show modest signs of improvement after bearing the brunt of the Canadian impact of the Asia crisis.**

Moreover, all governments have significantly improved their fiscal situation — leaving all regions better positioned to seize opportunities flowing from the new economy.

Corporate Profits Growth, 1992-97



Source: Statistics Canada

Budget Balance as a Proportion of GDP*

	1992-93 (%)	1997-98 (%)
British Columbia	-1.9	-0.1
Alberta	-4.6	2.6
Saskatchewan	-2.8	0.1
Manitoba	-2.3	0.3
Ontario	-4.4	-1.1
Quebec	-3.2	-1.1
New Brunswick	-1.9	0.4
Nova Scotia	-3.4	0.2
Prince Edward Island	-3.5	-0.2
Newfoundland	-2.7	-0.1
Federal	-5.9	0.4

* Public accounts basis (a negative number indicates a deficit)
Source: Department of Finance

...allowing for a general public commitment to the new economy

Indeed, recent federal and provincial budgets include a number of initiatives which focus on innovation, information technologies and human capital.

Selected KBE Initiatives

Federal (1998 and 1999 Budgets)

- **Innovation**
  - Canadian Foundation for Innovation
  - Technology Partnerships Canada
  - Industrial Research Assistance Program
- **Connectedness:**
  - Community Access Program
  - SchoolNet
  - Smart Communities Development Project
- **Human Capital:**
  - Financial assistance for students
  - Tax relief for life-long learning
  - Support for advanced research and graduate students

Provincial (1998 Budgets)

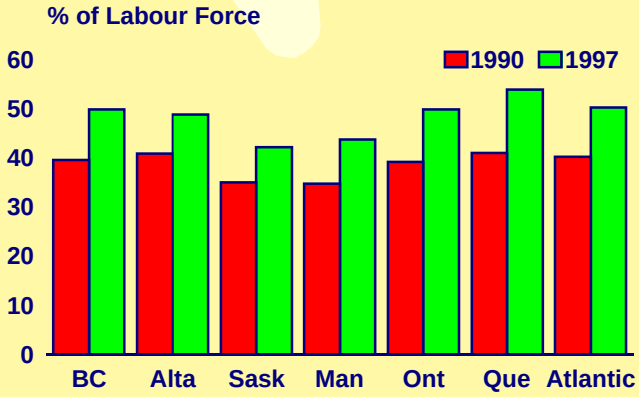
- **New Economic Strategy (Nova Scotia, Quebec)**
- **Increased R&D Initiatives (Manitoba, Ontario, Saskatchewan)**
- **Science & Technology Funding (Alberta, Manitoba, Newfoundland, Ontario, Saskatchewan)**
- **High Skill Initiatives (BC, New Brunswick, Ontario)**

All regions are also increasingly well-endowed in skilled labour...

Human capital has a crucial role in the knowledge economy — skilled and educated workers are needed to maximize the benefits of new technologies.

- **In this regard, all regions are well prepared as they are similarly well-endowed in knowledge workers.**

High-Knowledge Workers



Source: Industry Canada calculations based on Statistics Canada data

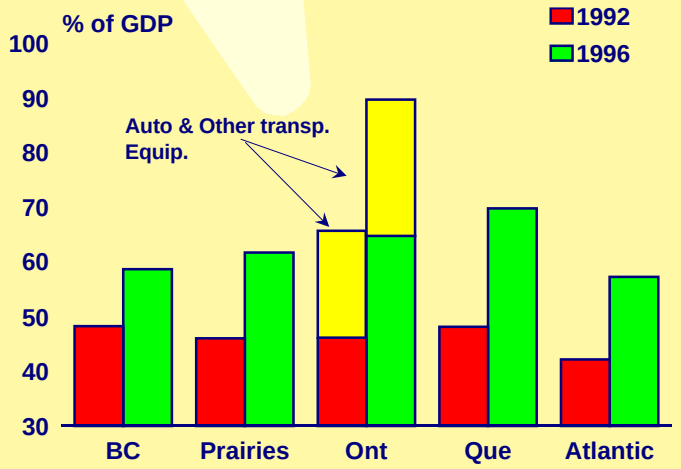
...and increasingly open to the rest of the world

Openness to trade is necessary if economies are to exploit their competitive advantages and become more efficient and richer.

- **Trade (exports plus imports) represents 90% of Ontario's GDP, compared to an average of 64% for the rest of Canada. This discrepancy can be attributed, however, to the important share of autos and other transportation equipment in Ontario's international trade.**

- **All provinces have increased their trade-orientation over the 1992-1996 period.**

Trade in Goods and Services*



* (Exports + Imports)/GDP

Source: Statistics Canada

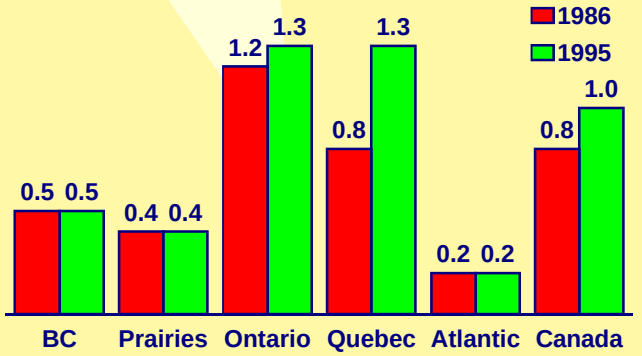
But Ontario is more innovative — it leads in R&D...

R&D spending relative to GDP is highest in Central Canada.

More than half of Canadian R&D expenditures in 1995 took place in Ontario, and almost another 30% in Quebec.

R&D Business Expenditures

% of GDP



Regional Share of R&D Business Expenditures, 1995					
7.2	7.8	55.3	28.4	1.3	100.0

Source: Industry Canada calculations based on Statistics Canada data; Statistics Canada

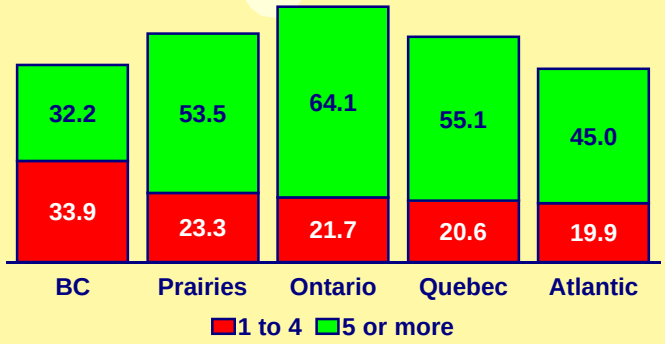
...in technology adoption...

The use of advanced technologies is greatest in Ontario, followed by the Prairies and Quebec.

- **Ontario is distinct in its high percentage of firms using multiple advanced technologies.**

Number of Advanced Technologies Used
Manufacturing Sector, 1993

% of Total Shipments



Source: J. Baldwin and D. Sabourin, *Technology Adoption in Canadian Manufacturing*, Statistics Canada, 1995.

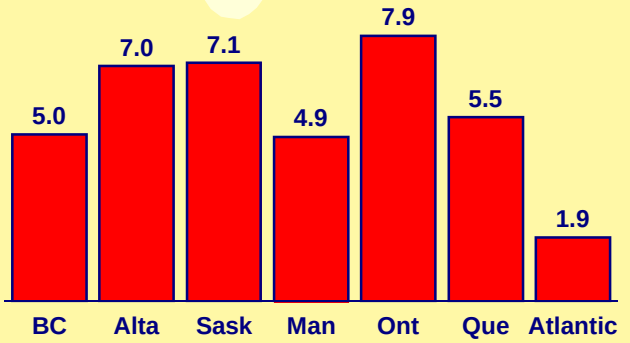
...in inventiveness...

Ontario and the Prairies are also more "inventive" as measured by patents granted.

- **In relative terms, they are granted three to four times as many patents as Atlantic Canada.**

Patents Granted
1993-1995

Per 100,000 Workers



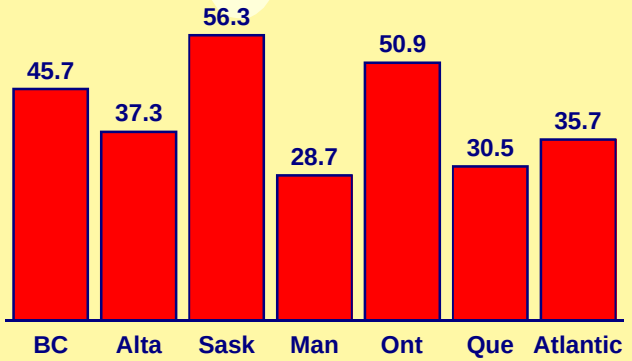
Source: Industry Canada, Canadian Intellectual Property Office

...and formal training within the workplace

Firms in Saskatchewan and Ontario are more likely to offer formal training to workers, followed by firms in BC and Alberta.

Formal training by firms is lowest in Manitoba and Quebec.

Percentage of Establishments with Formal Training, 1995



Source: G. Betcherman, J.N. Leckie and K. McMullen, *Developing Skills in the Canadian Workplace: The Results of the Ekos Workplace Training Survey*, CPRN Study W / 02, 1997.

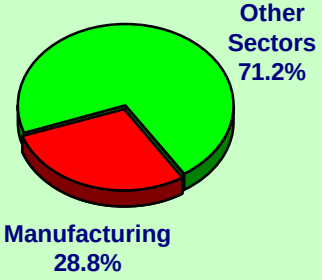
Ontario benefits from its industrial structure...

Higher R&D spending and more formal training by firms in Ontario partly reflects the province's industrial make-up — including a strong manufacturing sector and a high concentration of large firms.

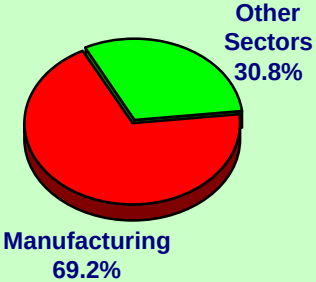
- **The manufacturing sector invests more than other sectors in R&D.**

- **Evidence also shows that large firms invest more in R&D and provide more formal training.**

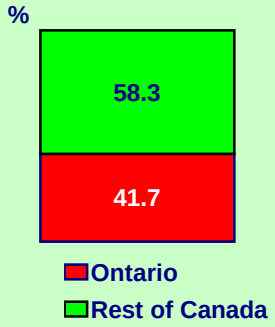
Share of Output*, Ontario, 1995



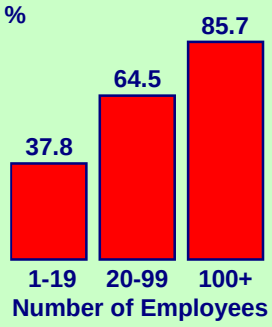
Share of R&D Expenditures*, Ontario, 1995



Regional Share of Large Firms*, 1996



Incidence of Training by Firm Size, 1995



* Business Sector

Source: Statistics Canada; G. Betcherman, J.N. Leckie and K. McMullen, *Developing Skills in the Canadian Workplace: The Results of the Ekos Workplace Training Survey*, CPRN Study W / 02, 1997.

...and the presence of more foreign subsidiaries

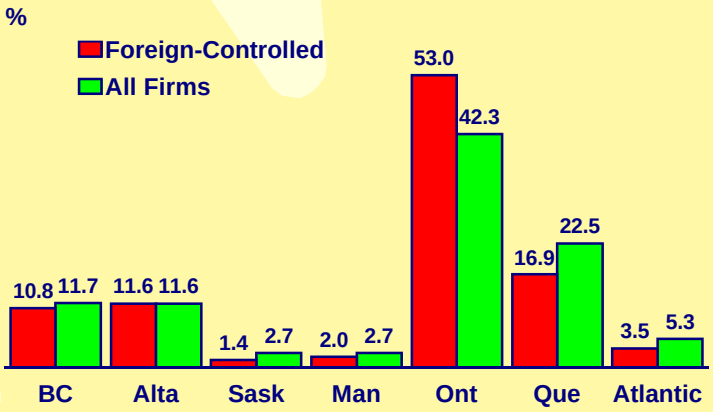
Foreign subsidiaries are heavily concentrated in Ontario — where more than half of all revenues of foreign subsidiaries in Canada originate.

Foreign-controlled firms are much more trade-oriented than domestic firms.

- **Exports as a share of total sales of foreign-controlled firms is about twice that of domestic firms. For imports, this ratio is nearly three times greater.**

Foreign subsidiaries are also recognized as an important channel for the adoption of world-class technologies.

Provincial Share of Corporate Revenue 1991



Source: Industry Canada calculations based on Statistics Canada data

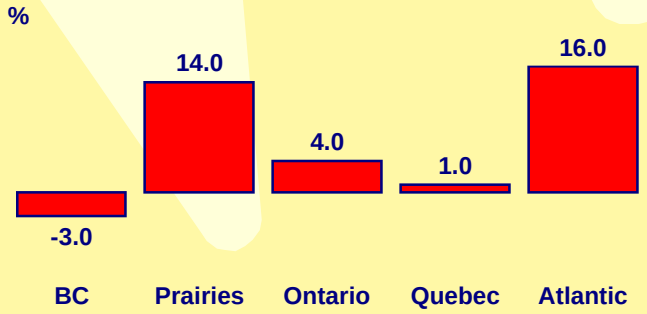
However, the Prairies are adopting new technologies faster...

The Prairie and Atlantic provinces have seen the largest increase in their use of advanced technologies.

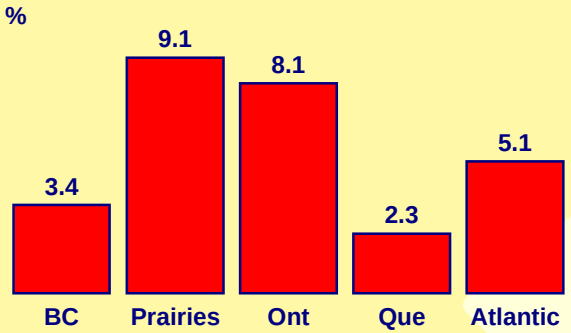
Furthermore, from 1992 to 1997, the Prairies posted the strongest growth in M&E investment, particularly in high-knowledge industries.

- **However, Quebec and BC lagged in technology adoption.**

Change in the Use of at Least One Advanced Technology, 1989 to 1993*



Growth in M&E Investment, Average Annual Growth, 1992-1997



* Given the small size of the sample in BC, the possibility that there was no change between 1989 and 1993 cannot be ruled out.
Source: J. Baldwin and D. Sabourin, *Technology Adoption in Canadian Manufacturing*, Statistics Canada, 1995; Statistics Canada.

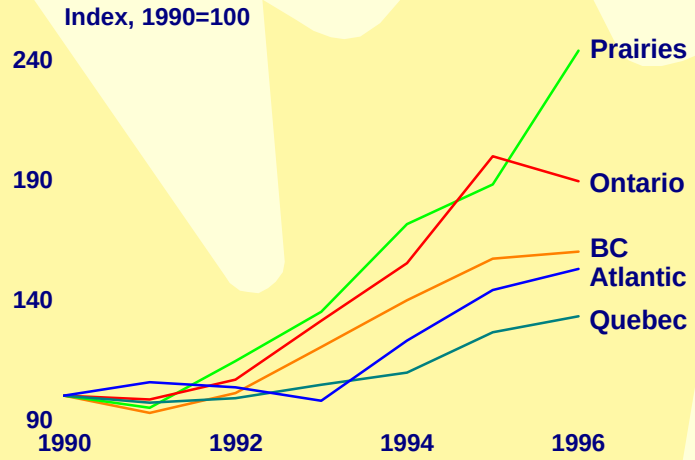
...especially foreign technologies

Since the beginning of the 1990's, the Prairies have led all regions in the growth of M&E imports, followed by Ontario.

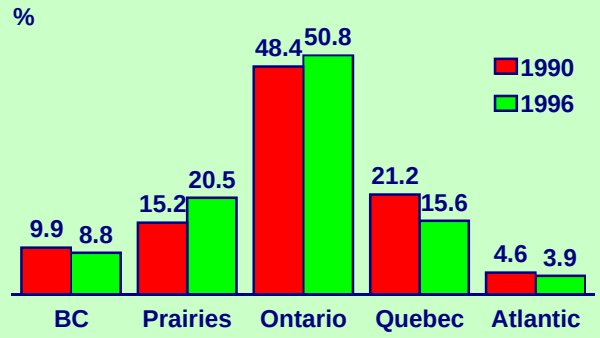
The pace of foreign M&E investment was slowest in Quebec.

- **As a result, Quebec's share of international M&E has been declining steadily.**

International M&E Imports



Share of International M&E Imports

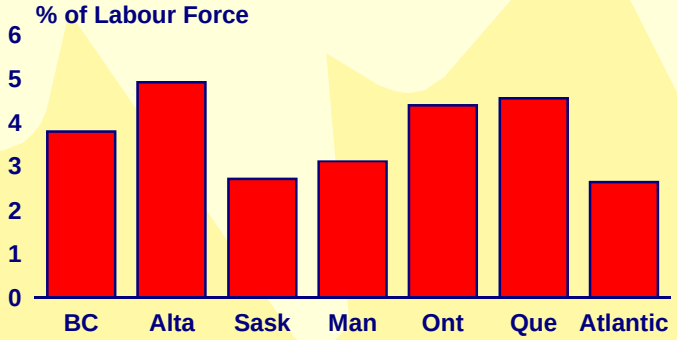


Source: Statistics Canada

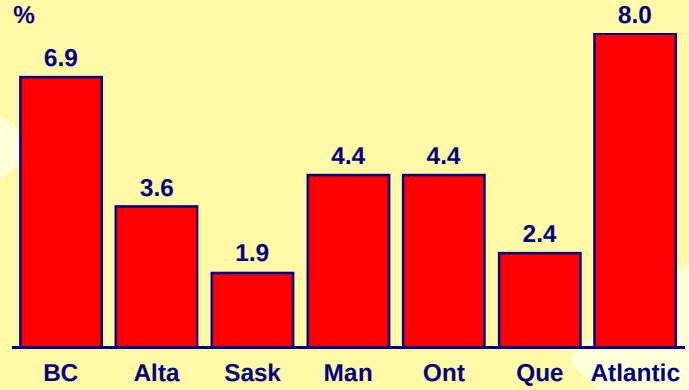
All regions show growth in "high-knowledge" education...

Although the Prairies, Ontario and Quebec still have a higher relative share of engineers and scientists, enrollment in other provinces is picking-up sharply.

Scientists and Engineers*, 1997



Annual Growth in Sciences & Engineering* Post-Secondary Enrollment, 1990/91-1996/97



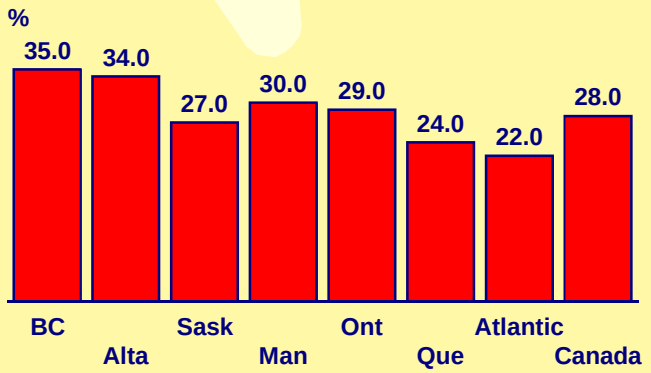
* Sciences & Engineering includes Agricultural and Biological Sciences, Engineering and Applied Science, and Mathematics and Physical Sciences at the undergraduate level and of Engineering & Applied Sciences and Natural Sciences & Primary Industries at the community college level
Source: Industry Canada calculations based on Statistics Canada data

...with Western Canada leading in life-long learning...

Adult training, which refers to education and training activities beyond regular formal education, is highest in BC and Alberta.

- It is well below the national average in Atlantic Canada and Quebec.

Participation Rates* in Adult Training 1993



* Share of adult population (17 and over) pursuing some education and training activities

Source: Statistics Canada, Education and Training Survey, 1997

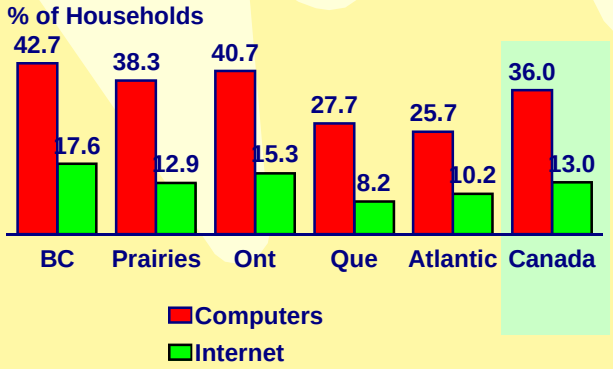
...and connectedness

In provinces west of Quebec, a higher share of households use computers and surf the Internet.

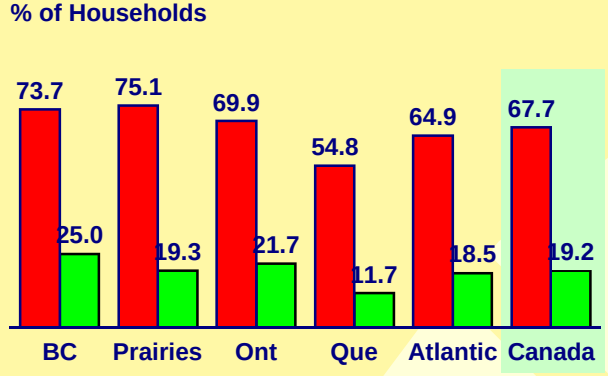
- **This partly reflects their traditionally higher income per capita.**

Business use of computers and the Internet is also higher in Ontario and the western provinces.

Household Use of Computers and Internet, 1997



Business Use of Computers and Internet, 1997



Source: Statistics Canada

Common key challenges include attracting investment...

The level of corporate income tax (CIT) is an important determinant of a firm's decision to invest.

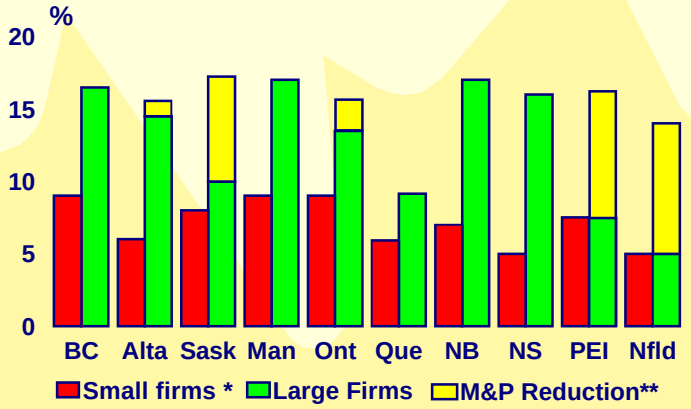
CIT rates vary considerably across provinces.

- **Half the provinces offer lower CIT rates for small firms and for manufacturing and processing firms.**

- **Large non-manufacturing firms face the lowest CIT rate in Quebec and the highest rate in Saskatchewan.**

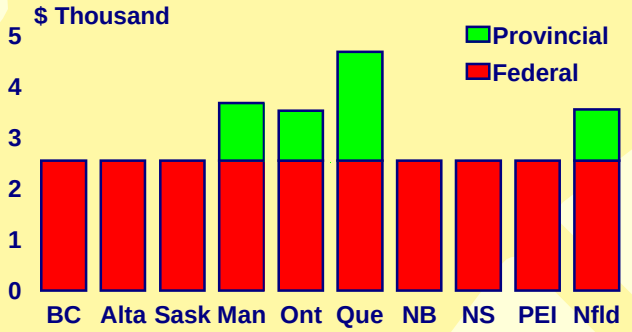
Note, however, that in some provinces low corporate tax rates are accompanied by provincial payroll taxes.

Provincial Corporate Income Tax Rate



*Applies to the first $200,000 of active business income of Canadian-controlled private corporations. Some provinces provide tax holidays for new small enterprises.
**Rate reduction applicable to profits from manufacturing and processing activities
Source: KPMG

Payroll Taxes by Province*



* Figures include employer portion of federal EI premiums, CPP/QPP premiums and provincial payroll taxes based on wages of $50,000. Excludes Worker's Compensation Premiums (WCB)
Source: KPMG

...closing the innovation gap...

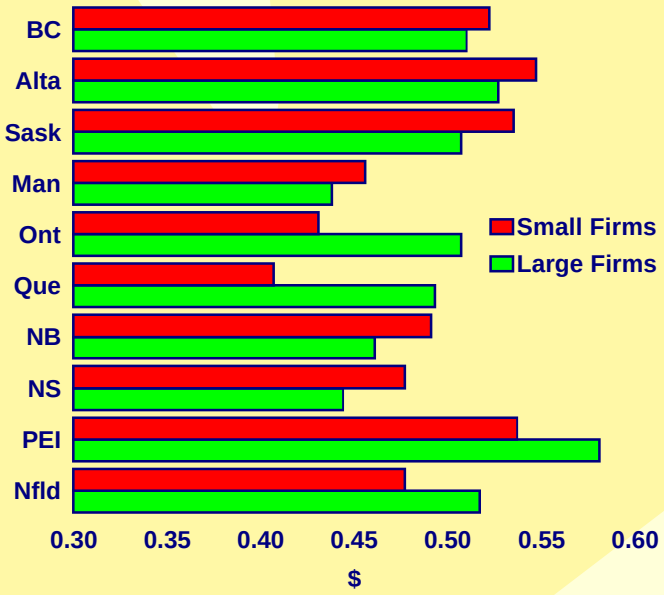
OECD analyses suggest that Canada has an innovation gap when compared to the U.S., despite Canada's more generous R&D tax treatment.

The after-tax costs of $1 of R&D, while generally low, do vary significantly across provinces.

- **For small firms, they vary from $0.41 in Quebec to $0.55 in Alberta.**

- **For large firms, they range from a low of $0.44 in Manitoba to a high of $0.58 in PEI.**

After-Tax Cost of Performing R&D*



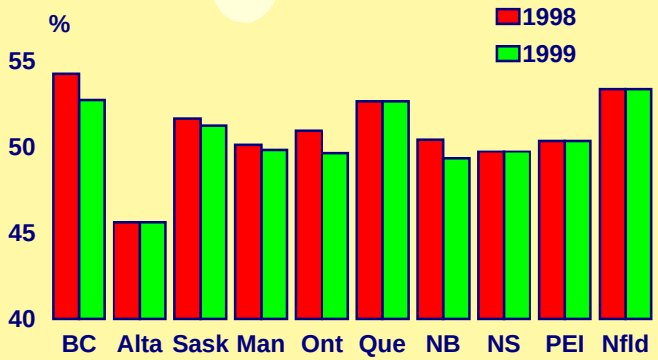
* After Tax Cost of performing $1.00 of R&D
Source: Conference Board of Canada, 1997 and 1998

...and retaining skilled workers

Differences in provincial personal income tax rates can influence the decision of mobile, knowledge workers to locate in a particular province.

The highest personal income tax rates are in Newfoundland, Quebec and BC, while Alberta has the lowest rate.

Top Combined Personal Tax Rates on Salary*



*Generally applies to incomes above $64,000
Source: Deloitte & Touche, Tax Breaks, June, 1998

Regional "Readiness" for the KBE

"Readiness" for the KBE — Concluding Remarks

While there is a strong commitment to the new economy and each region is showing significant progress, differences still persist in terms of the regions' respective "readiness" for the KBE.

- **Ontario is well positioned to seize opportunities — it leads or is among the leaders with respect to most KBE factors.**

- **The Prairie provinces have recently shown significant progress — particularly in terms of the adoption of new technologies as well as their development of information and communication technological infrastructure.**

- **Quebec compares favourably to its sister provinces in terms of technological infrastructure, but recent growth in investment has been slow, both in terms of human capital and technology.**

- **Another cause for concern is BC's weak innovation performance — in part attributable to its reliance on less innovative industries.**

- **Although Atlantic Canada is showing clear signs of improvement in most KBE areas, it must become more innovative to fully reap the benefits of the new economy.**

"Readiness" for the KBE — in a Nutshell

	Innovation	Human Capital	Globalization	Infrastructure in ICTs*	Business Climate
BC					
Prairies					
Ontario					
Quebec					
Atlantic					

 **Leading and Improving**

 **Lagging but Improving**

 **Leading but Losing Ground**

 **Lagging and Losing Ground**

* Information and communication technologies

Annex

Selected Provincial KBE Indicators

% unless otherwise mentioned	BC	Alta	Sask	Man	Ont	Que	NB	NS	PEI	Nfld
High Knowledge Output (1992 millions $)	8,334	10,834	2,027	2,799	39,478	21,018	1,169	1,153	140	784
Average Annual Growth Rate (1984-1997)	4.7	5.7	4.6	4.5	4.4	3.6	2.6	1.7	5.3	1.6
High Knowledge Share of Business Output, 1997	12.0	14.8	10.6	14.9	17.5	18.5	12.1	9.8	8.1	13.3
M&E Investment as a percentage of GDP, 1997	5.6	7.9	7.4	5.9	7.2	5.5	4.7	7.6	3.9	4.4
R&D Spending as a percentage of GDP, 1995	0.5	0.5	0.2	0.3	1.3	1.3	0.3	0.2	0.0	0.1
Trade Openness, 1997 -- Exports plus Imports as percentage of GDP	61.6	64.1	71.1	62.5	97.2	71.3	75.0	54.3	34.4	53.5
High-Knowledge Workers as a Share of Total Labour Force, 1997	49.7	48.7	42.1	43.6	49.7	53.8	45.6	53.9	45.5	51.2
Hourly Wage Rate ($), 1997										
High-Knowledge Workers	19.46	17.47	16.28	16.20	19.21	17.69	15.36	14.71	14.16	15.40
Low-Knowledge Workers	12.89	10.69	10.35	10.85	12.17	11.87	9.93	10.15	8.95	9.86
Connectedness:										
Household Use of Computers, 1997	42.7	43.0	32.9	31.9	40.7	27.7	25.3	26.9	21.6	25.1
Household Use of Internet, 1997	17.6	14.9	8.9	11.7	15.3	8.2	10.9	10.2	7.8	10.1

Business Sector Industry Classification

There are high-knowledge and low-knowledge firms in all industries. However, data constraints at the regional level require that we conduct our analysis at the industry level rather than at the firm level. The industrial classification* used here focuses on the average characteristics of all firms in a particular industry and highlights the concentration of knowledge-based activity within that industry.

In this analysis, we concentrate on the performance of business sector industries which are classified as high-knowledge industries. The analysis of these industries, which exhibit the characteristics of the KBE, give a general indication of the performance of the new economy at the regional level.

High-Knowledge

- Scientific & Professional Equipment
- Communication & Other Electronics
- Business Machines
- Aircraft & Parts
- Computer & Related services
- Engineering & Scientific Services
- Pharmaceutical, Medicine & Other Chemical Products
- Electrical Power
- Machinery
- Refined Petroleum & Coal Products
- Management Consulting services
- Pipeline Transportation
- Other Business Services

Medium-Knowledge

- Other Electrical & Electronics
- Other Transportation Equipment
- Primary Metals (Non-Ferrous)
- Textiles
- Communication
- Paper & Allied Products
- Mining
- Rubber
- Plastics
- Primary Metals (Ferrous)
- Non-metallic Mineral Products
- Wholesale Trade
- Crude Petroleum & Natural Gas
- Fabricated Metal Products
- Motor Vehicles & Parts
- Food
- Beverages
- Tobacco
- Finance, Insurance & Real Estate
- Other Utilities
- Services Incidental to Mining
- Other Services
- Printing & Publishing
- Construction
- Amusement & Recreational Services

Low-Knowledge

- Other Manufacturing Products
- Fishing & Trapping
- Wood
- Furniture & Fixtures
- Logging & Forestry
- Transportation
- Storage & Warehousing
- Agriculture
- Retail Trade
- Personal Services
- Quarry, Sand Pits & Mining Services
- Accommodation, Food & Beverage Services
- Clothing
- Leather

* Lee, Frank C. & Handan Has, "A Quantitative Assessment of High-Knowledge Industries Versus Low-Knowledge Industries", *The Implications of Knowledge-Based Growth for Micro-Economic Policies*, Industry Canada, 1996.

For Further Information

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The *Micro-Economic Monitor* is prepared on a quarterly basis by the Micro-Economic Analysis Directorate of Industry Canada. The Monitor provides a quick and easy-to-read update on Canada's economic performance. It also provides topical in-depth reports on current economic issues from a micro-economic perspective.

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