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Who Are Canada's Key Chemistry Patent Holders?

A Comparative Analysis With U.S. Holders

DATA BRIEFING | July 7, 2026

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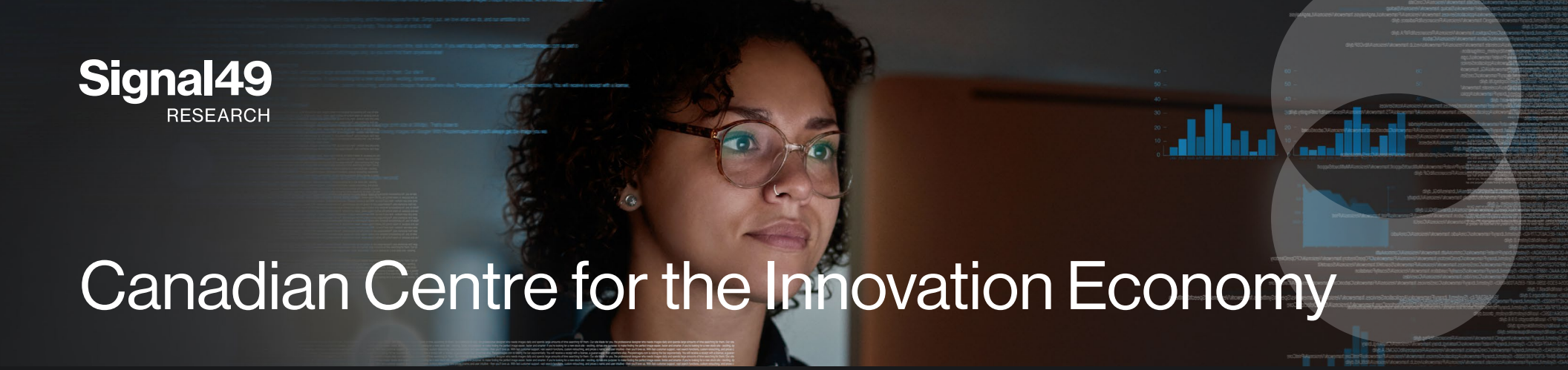

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Canada has an innovation problem. We have a highly educated workforce and strong research capability, but consistently lack commercial success and innovation-based economic growth. This problem is known as Canada's innovation paradox, and it's the problem the Canadian Centre for the Innovation Economy is here to address.

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Key findings

- Ownership of chemistry patents is significantly more concentrated in Canada than in the United States. On average across 11 technology classes, the top 10 Canadian patent holders account for 22.1 per cent of total patents compared with 16.2 per cent in the U.S., a 5.9 percentage point gap that is statistically significant.
- While Canada shows more public sector participation than the U.S., most technology fields in both countries are dominated by private companies.
- Emerging technology fields show the highest concentration in Canada. Microstructural, nanotechnology, and biotechnology exhibit the greatest concentration among Canada's top patent holders.
- Patent ownership in environmental technology in Canada demonstrates the highest diversity but lowest concentration compared with other chemistry fields. The largest 10 patent holders in Canada account for 9.3 per cent of environmental technology patents, compared with a concentration of 22 per cent in organic chemistry.
- University and government entities dominate several chemistry fields in Canada. In areas such as biotechnology, pharmaceuticals, and microstructural and nanotechnology, Canadian top 10 lists are heavily weighted toward universities and government organizations, whereas U.S. lists are almost entirely private sector firms. This difference highlights Canada's reliance on public research institutions for innovation in these fields.

Comparing chemistry patent holders

We identify Canada's top 10 patent[1] holders across 11 technology classes in chemistry and compare the patent ownership concentration with that of the United States.[2] Drawing on the analysis of 21,633 patent families for Canada and 681,873 for the U.S., we examine both the share of total patents held by leading organizations and the types of entities involved—private companies, universities, government agencies, and individuals. By offering a granular view of who is driving innovation in Canada, this data briefing complements the findings of *Intellectual Property in Canada: Technology Specialization and Competitive Advantage,* which mapped Canada's inventive strengths and weaknesses but did not identify the actors behind them. It offers two key insights:

- the degree of ownership concentration
- the commercialization potential of Canada's innovation system.

Because the U.S. operates at a vastly larger absolute scale of patenting, its commercialization potential is generally higher regardless of concentration levels. Therefore, when Canada exhibits higher concentration than the U.S. in a given field, this should not be interpreted as the U.S. being at a disadvantage. Rather, it signals that Canada may have a stronger competitive footing within that specific technology class. In this context, the relationship between concentration and commercialization capacity is more meaningful for Canada than for the U.S., as concentration can help compensate for its smaller overall patenting base.

For policy-makers, this data helps identify key organizations for targeted support, whether through intellectual property (IP) policy or investment incentives.[3] For innovators, it clarifies the competitive landscape and reveals potential partners for collaboration or licensing. From a national innovation system perspective, patents held by private companies are especially valuable, as they are more likely to be commercialized and scaled. Ultimately, this evidence-based approach informs innovation policy aimed at strengthening Canada's global competitiveness. See Exhibit 1 for a description on how to read the tables.

1 For ease of reference and simplicity, we use "patents" to refer to "patent families". A patent family is a collection of patents that are considered to cover a single invention. We focus on patent families instead of patents because individual patents inflate patent counts for companies as they file patents for strategic/litigation reasons other than simply disclosing a novel product or process.

2 While it is obvious that Canada and the U.S. differ considerably in economic size and overall patenting activity, this analysis does not aim to compare the absolute number of patents held by organizations in each country. Instead, it focuses on the share of total patents held by the top 10 patent holders and the composition of those organizations. These indicators are normalized and unaffected by the size differences between the two economies, allowing for meaningful insights into ownership concentration and commercialization potential.

3 While high market concentration can raise valid concerns about reduced competitiveness or monopolistic behaviour—particularly in consumer-facing sectors such as grocery retail or airlines—this dynamic differs in innovation-driven sectors. In these sectors, competition is global, and technological leadership is often determined by the ability to scale, attract talent, and invest in R&D.

Exhibit 1
Guide to reading tables

Name of the organization used in the patent application

Legal status of the entity: company, government, university, hospital, individual

Collection of patents corresponding to a single invention

	Canada			United States		
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Organization A				Organization A			
Organization B				Organization B			
Organization C				Organization C			
Organization D				Organization D			
Organization E				Organization E			
Organization F				Organization F			
Organization G				Organization G			
Organization H				Organization H			
Organization I				Organization I			
Subtotal		**N1**	**P1**	**Subtotal**		**N3**	**P3**
General total		**N2**	**P2**	**General total**		**N4**	**P4**

Total number of active patent families owned by the top 10 Canada-based assignees in a particular technology field

Percentage of total number of active patent families owned by Canada-based assignees in a particular technology field

Total number of active patent families owned by U.S.-based assignees in a particular technology field

Percentage of total number of active patent families owned by U.S.-based assignees in a particular technology field

Total number of active patent families owned by Canada-based assignees in a particular technology field

Percentage of patent families owned by the top 10 Canada-based assignees in a particular technology field

Patent families owned by the top 10 U.S.-based assignees in a particular technology field

Percentage of patent families owned by the top 10 U.S.-based assignees in a particular technology field

Source: Signal49 Research.

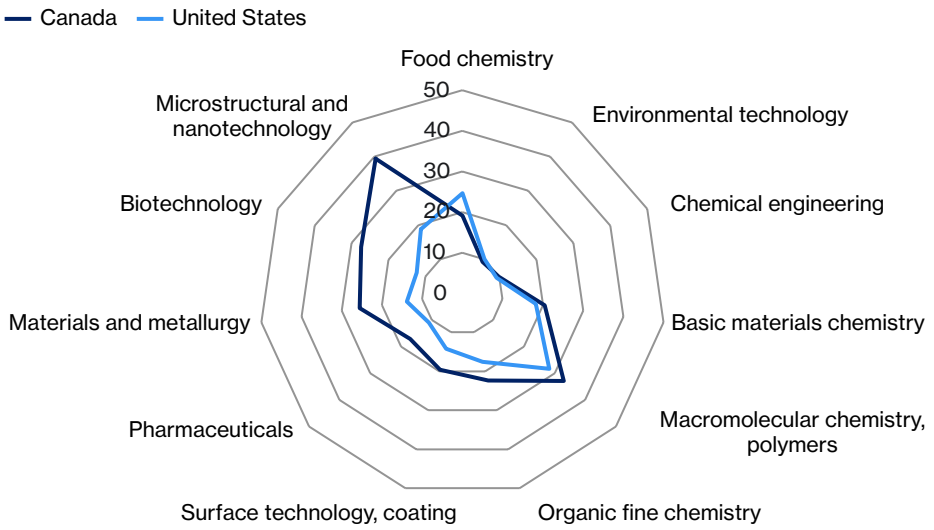
Canada exhibits a higher level of patent ownership concentration across electrical engineering technologies. (See Chart 1.) However, country-level differences are small in most fields, with Canada and the U.S. displaying broadly similar concentration patterns. The two notable exceptions are materials and metallurgy and biotechnology, where Canada's concentration is substantially higher, indicating stronger dominance by leading Canadian patent holders in those specific areas.

A smaller share of patent families is owned by private companies in Canada than in the U.S., implying a larger relative role for universities, hospitals, and government in Canada's innovation ecosystem. (See Chart 2.) This composition can dampen near-term commercialization and scale-up unless paired with strong public–private partnerships, licensing, and spin-out pathways.

Chart 1

Concentration of patent family ownership is higher in Canada

(percentage of patent families owned by the top 10 organizations in respective countries)

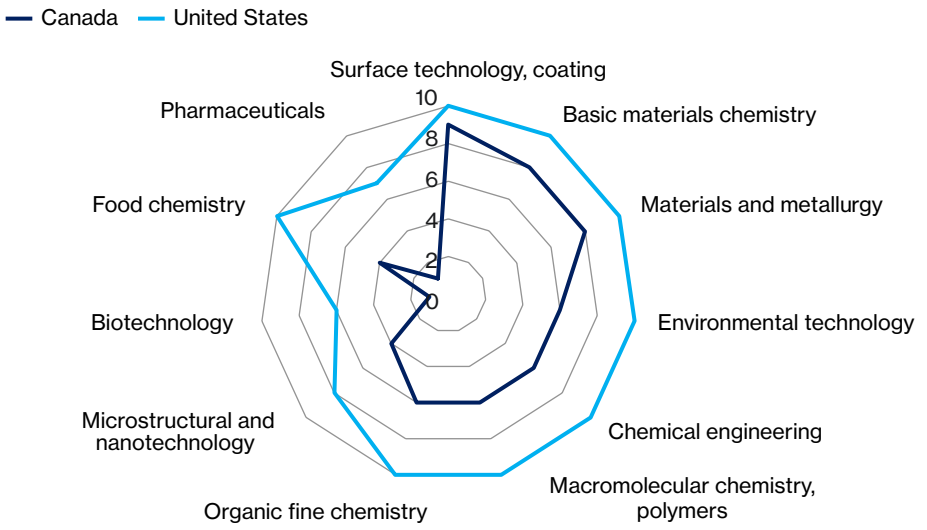


Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Chart 2

Private sector ownership of patent families is lower in Canada

(number of private companies in the top 10 organizations in respective countries)



Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Environmental technology

- Canada's top 10 patent holders account for 9.3 per cent of environmental technology patents, compared with 10.0 per cent in the U.S., indicating similar concentration in both countries. (See Table 1.)
- Canada's top 10 include four non-private organizations (one university and three government entities), showing a notable public sector presence, while the U.S. list is entirely private sector.

Table 1
Trojan Technologies is the largest patent holder related to environmental technology in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Trojan Technologies	Company	28	1.42	Ford	Company	846	2.14
Advanced Technology Emission Solutions	Company	23	1.13	GE	Company	733	1.85
University of Waterloo	University	19	0.95	GM	Company	629	1.58
National Research Council	Government	18	0.92	Donaldson Company	Company	305	0.77
Atomic Energy of Canada	Government	18	0.90	Universal Oil Products Company (Uop)	Company	299	0.75
Ovivo	Company	17	0.85	Air Products And Chemicals	Company	290	0.73
Government of Canada	Government	16	0.81	Caterpillar	Company	268	0.68
Anaergia	Company	16	0.81	Nalco	Company	247	0.62
Omachron Intellectual Property	Company	15	0.75	Shell Oil Company	Company	176	0.44
Shell Canada	Company	14	0.71	Corning	Company	170	0.43
Subtotal	**n.a.**	**185**	**9.26**	**Subtotal**	**n.a.**	**3,963**	**9.99**
General total	**n.a.**	**1,994**	**100**	**General total**	**n.a.**	**39,625**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Chemical engineering

- Canada's top 10 patent holders account for 9.9 per cent of chemical engineering patents, compared with 9.2 per cent in the U.S., indicating a similarly diffused ownership structure in both countries. (See Table 2.)
- Canada's top 10 include four non-private organizations (three government entities and one university), showing a notable public sector presence, while the U.S. list is entirely private sector.

Table 2
Shell Canada is the largest patent holder related to chemical engineering in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Shell Canada	Company	74	2.23	Universal Oil Products Company	Company	1,534	1.86
Government of Canada	Government	38	1.14	Exxon	Company	1,024	1.24
Atomic Energy of Canada	Government	37	1.12	Mobil Oil Corporation	Company	897	1.09
National Research Council	Government	32	0.96	Shell Oil Company	Company	701	0.85
Alcan International	Company	31	0.95	Dupont	Company	677	0.82
Suncor Energy	Company	29	0.87	Phillips Petroleum Company	Company	669	0.81
University of British Columbia	University	26	0.77	GE	Company	659	0.80
Schlumberger Canada	Company	24	0.72	Air Products And Chemicals	Company	532	0.65
Trojan Technologies	Company	22	0.67	Dow Chemical Company	Company	505	0.61
V3 Companies	Company	17	0.52	Standard Oil Company	Company	403	0.49
Subtotal	**n.a.**	**331**	**9.93**	**Subtotal**	**n.a.**	**7,600**	**9.22**
General total	**n.a.**	**3,330**	**100**	**General total**	**n.a.**	**82,282**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Pharmaceuticals

- In pharmaceuticals, Canada's top 10 patent holders account for 17.0 per cent of patents compared with 11.0 per cent in the U.S., indicating higher concentration in Canada—a pattern that gives Canada a stronger chance to compete in this technology field. (See Table 3.)
- Canada's top 10 include nine non-private organizations (six universities, two hospitals, one government entity), showing a major public sector role, while the U.S. list is dominated by private companies with a few universities.

Table 3
University of British Columbia is the largest patent holder related to pharmaceuticals in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
University of British Columbia	University	132	3.76	Merck & Company	Company	1,735	1.82
Merck Frosst Canada	Company	88	2.51	Eli Lilly and Company	Company	1,292	1.35
McGill University	University	68	1.95	Pfizer	Company	1,249	1.31
University of Alberta	University	58	1.64	University of California	University	1,202	1.26
University of Saskatchewan	University	57	1.62	Harvard University	University	1,161	1.22
National Research Council	Government	46	1.32	Bristol-Myers Squibb Company	Company	1,052	1.10
University Health Network	Hospital	46	1.31	Roche	Company	923	0.97
University of Toronto	University	38	1.09	Warner-Lambert Company	Company	624	0.65
Laval University	University	33	0.95	University of Texas	University	618	0.65
The Hospital for Sick Children	Hospital	31	0.89	Genentech	Company	615	0.64
Subtotal	**n.a.**	**597**	**17.03**	**Subtotal**	**n.a.**	**10,471**	**10.97**
General total	**n.a.**	**3,505**	**100**	**General total**	**n.a.**	**95,442**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Food chemistry

- Canada's top 10 patent holders account for 19.2 per cent of food chemistry patents, compared with 24.6 per cent in the U.S., indicating a more diffused ownership structure in Canada, which may hinder commercialization and scale-up in this field. (See Table 4.)
- Canada's top 10 include six non-private organizations (two government entities and four universities), showing a major public sector role, while the U.S. list is entirely private sector.

Table 4
Government of Canada is the largest patent holder related to food chemistry in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Government of Canada	Government	58	5.84	Pioneer Hi-Bred International	Company	3,092	7.36
Burcon Nutrascience	Company	43	4.27	Monsanto	Company	2,890	6.88
Labatt Brewing Company	Company	16	1.63	Aris Horticulture	Company	786	1.87
University of Guelph	University	16	1.56	M.S. Technologies	Company	670	1.59
National Research Council	Government	14	1.39	Intercontinental Great Brands (Kraft Foods)	Company	600	1.43
University of Saskatchewan	University	12	1.23	Procter & Gamble Company	Company	522	1.24
University of British Columbia	University	10	0.97	Ball Horticultural Company	Company	458	1.09
University of Alberta	University	8	0.80	General Foods Corporation	Company	452	1.07
Ocean Nutrition Canada	Company	8	0.80	Terra Nova Nurseries	Company	440	1.05
McCain Foods	Company	7	0.69	Seminis	Company	432	1.03
Subtotal	**n.a.**	**192**	**19.18**	**Subtotal**	**n.a.**	**10,342**	**24.61**
General total	**n.a.**	**1,000**	**100**	**General total**	**n.a.**	**42,028**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Surface technology and coating

- Canada's top 10 patent holders account for 19.7 per cent of surface technology and coating patents, compared with 14.2 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 5.)
- In both countries, the top 10 patent holders are dominated by companies, with only one non-private organization appearing in Canada's list.

Table 5
Alcan International is the largest patent holder related to surface technology and coating in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Alcan International	Company	121	7.89	Applied Materials	Company	1,955	3.61
Rio Tinto	Company	56	3.64	GE	Company	1,200	2.22
National Research Council	Government	29	1.86	IBM	Company	804	1.49
Ford Motor Canada	Company	18	1.18	Dupont	Company	755	1.39
Integran Technologies	Company	17	1.11	3M Company	Company	667	1.23
Pratt & Whitney Canada Corp.	Company	16	1.02	Boeing Company	Company	609	1.12
Novelis	Company	13	0.84	United Technologies Corporation (Utc)	Company	563	1.04
Magna	Company	12	0.75	Dow Chemical Company	Company	414	0.77
Elysis Limited Partnership	Company	10	0.68	LAM Research Corporation	Company	373	0.69
Pultrusion Technique	Company	10	0.68	Kodak	Company	359	0.66
Subtotal	**n.a.**	**302**	**19.65**	**Subtotal**	**n.a.**	**7,699**	**14.22**
General total	**n.a.**	**1,539**	**100**	**General total**	**n.a.**	**54,126**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Basic materials chemistry

- Canada's top 10 patent holders account for 20.4 per cent of basic materials chemistry patents, compared with 18.2 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 6.)
- Both Canada and the U.S. are dominated by private companies among the top 10, with only two non-private organizations appearing in Canada's list.

Table 6
Schlumberger Canada is the largest patent holder related to basic materials chemistry in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Schlumberger Canada	Company	140	5.96	Procter & Gamble Company	Company	3,473	4.25
Shell Canada	Company	87	3.68	Mobil Oil Corporation	Company	1,633	2.00
Government of Canada	Government	50	2.13	Dupont	Company	1,524	1.87
Suncor Energy	Company	44	1.85	Exxon	Company	1,424	1.74
Imperial Oil	Company	60	2.56	Universal Oil Products Company (Uop)	Company	1,407	1.72
National Research Council	Government	26	1.09	Colgate-Palmolive Company	Company	1,291	1.58
Diversey Canada, Inc.	Company	20	0.86	Halliburton Energy Services Group	Company	1,118	1.37
Alcan International	Company	20	0.85	Ciba-Geigy	Company	1,074	1.31
Syncrude Canada Ltd.	Company	18	0.77	Shell Oil Company	Company	1,009	1.23
V3 Companies	Company	17	0.71	Lubrizol Corporation	Company	922	1.13
Subtotal	**n.a.**	**482**	**20.44**	**Subtotal**	**n.a.**	**14,874**	**18.20**
General total	**n.a.**	**2,358**	**100**	**General total**	**n.a.**	**81,689**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Organic fine chemistry

- Canada's top 10 patent holders account for 22.3 per cent of organic fine chemistry patents, compared with 17.5 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 7.)
- Canada's top 10 include four non-private organizations (three universities and one government entity), showing a notable public sector role, while the U.S. list is entirely private sector.

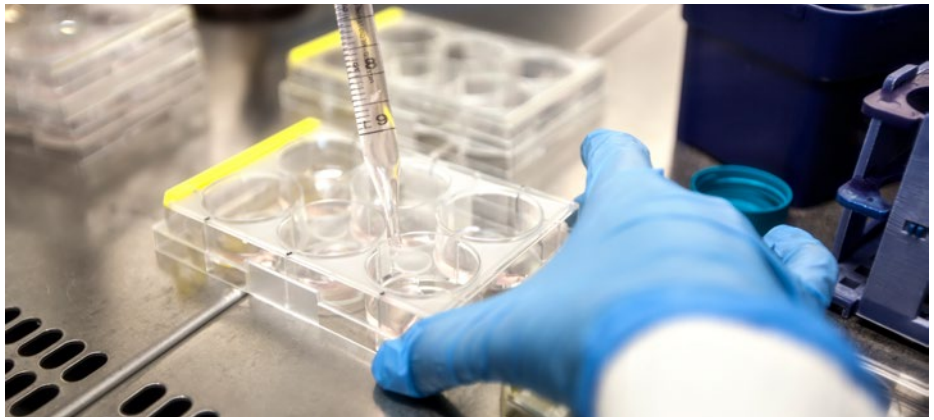


Table 7
Merck Frosst Canada is the largest patent holder related to organic fine chemistry in Canada

	Canada			United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Merck Frosst Canada	Company	94	5.04	Merck & Company	Company	3,133	3.08
Shell Canada	Company	62	3.33	Dupont	Company	2,254	2.22
University of Alberta	University	43	2.32	Procter & Gamble Company	Company	2,204	2.17
University of British Columbia	University	42	2.28	Pfizer	Company	1,758	1.73
McGill University	University	33	1.75	Eli Lilly & Company	Company	1,588	1.56
Apotex Pharmachem	Company	32	1.73	Roche	Company	1,486	1.46
Delmar Chemicals	Company	31	1.66	Ciba-Geigy	Company	1,462	1.44
National Research Council	Government	27	1.47	Universal Oil Products Company (Uop)	Company	1,459	1.44
Xenon Pharmaceuticals	Company	26	1.38	American Cyanamid Company	Company	1,233	1.21
Uniroyal	Company	25	1.37	Dow Chemical Company	Company	1,215	1.20
Subtotal	**n.a.**	**415**	**22.33**	**Subtotal**	**n.a.**	**17,792**	**17.51**
General total	**n.a.**	**1,857**	**100**	**General total**	**n.a.**	**101,598**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Materials and metallurgy

- Canada's top 10 patent holders account for 25.5 per cent of materials and metallurgy patents, compared with 13.8 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 8.)
- In both countries, the top 10 patent holders are dominated by companies, with only two non-private organizations appearing in Canada's list.

Table 8
Alcan International is the largest patent holder related to materials and metallurgy in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Alcan International	Company	230	9.91	Corning	Company	1,559	3.42
Novelis	Company	101	4.35	GE	Company	1,484	3.26
Sherritt Gordon Mines	Company	51	2.19	United Technologies Corporation	Company	587	1.29
National Research Council	Government	44	1.89	Alcoa	Company	526	1.15
Ford Motor Canada	Company	32	1.38	Dupont	Company	508	1.11
Hydro-Quebec	Government	30	1.30	Dow Chemical Company	Company	358	0.79
Schlumberger Canada	Company	29	1.23	Air Products And Chemicals	Company	324	0.71
Barrick Gold Corporation	Company	27	1.18	Union Carbide Corporation	Company	324	0.71
Government of Canada	Company	27	1.17	Halliburton Energy Services Group	Company	315	0.69
Shell Canada	Company	22	0.95	GTE Products Corporation	Company	295	0.65
Subtotal	**n.a.**	**592**	**25.54**	**Subtotal**	**n.a.**	**6,280**	**13.78**
General total	**n.a.**	**2,319**	**100**	**General total**	**n.a.**	**45,543**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Biotechnology

- Canada's top 10 patent holders account for 27.5 per cent of biotechnology patents, compared with 12.4 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 9.)
- Canada's top 10 are dominated by non-private organizations (six universities, two hospitals, one government entity), while the U.S. list shows a mix of universities and companies.

Table 9
National Research Council is the largest patent holder related to biotechnology in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
National Research Council	Government	134	5.60	University of California	University	1,533	2.14
University of British Columbia	University	93	3.88	Harvard University	University	1,274	1.77
Government of Canada	Government	87	3.64	Monsanto	Company	1,187	1.65
McGill University	University	83	3.46	Pioneer Hi-Bred International	Company	1,124	1.57
University of Alberta	University	60	2.52	Genentech	Company	886	1.23
University of Saskatchewan	University	52	2.19	Merck & Company	Company	717	1.00
University of Toronto	University	46	1.93	Government of The United States of America	Government	610	0.85
University Health Network	Hospital	35	1.47	Dupont	Company	580	0.81
Iogen Energy Corporation	Company	35	1.45	Eli Lilly & Company	Company	539	0.75
University of Guelph	University	32	1.33	University of Wisconsin	University	473	0.66
Subtotal	**n.a.**	**656**	**27.46**	**Subtotal**	**n.a.**	**8,922**	**12.43**
General total	**n.a.**	**2,388**	**100**	**General total**	**n.a.**	**71,791**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Macromolecular chemistry, polymers

- Canada's top 10 patent holders account for 33.0 per cent of macromolecular chemistry and polymer patents, compared with 28.4 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 10.)
- Canada's top 10 include four non-private organizations (three government entities and one not-for-profit), showing a major public sector role, while the U.S. list is entirely private sector.

Table 10
Nova Chemicals is the largest patent holder related to macromolecular chemistry and polymers in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
Nova Chemicals	Company	127	10.30	Dow Chemical Company	Company	4,791	7.46
Shell Canada	Company	55	4.46	GE	Company	3,181	4.96
Du Pont Canada	Company	53	4.33	Dupont	Company	2,752	4.29
Lanxess	Company	43	3.51	3M Company	Company	1,567	2.44
Bayer	Company	36	2.92	The Goodyear Tire & Rubber Company	Company	1,221	1.90
National Research Council	Government	26	2.13	Shell Oil Company	Company	1,109	1.73
Government of Canada	Government	21	1.74	Phillips Petroleum Company	Company	921	1.44
Hydro-Québec	Government	15	1.23	Ciba-Geigy	Company	920	1.43
FPInnovations	Non-profit	15	1.19	Rohm and Haas Company	Company	907	1.41
University of Alberta	Company	14	1.16	ExxonMobil	Company	831	1.30
Subtotal	**n.a.**	**405**	**32.97**	**Subtotal**	**n.a.**	**18,199**	**28.36**
General total	**n.a.**	**1,229**	**100**	**General total**	**n.a.**	**64,165**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Microstructural and nanotechnology

- Canada's top 10 patent holders account for 39.5 per cent of microstructural and nanotechnology patents, compared with 18.9 per cent in the U.S., indicating much higher concentration in Canada, which gives Canada a stronger chance to compete in this emerging field. (See Table 11.)
- Canada's top 10 include six non-private organizations (four universities and two government entities), showing a major public sector role, while the U.S. list is dominated by private companies with two universities.

Table 11
National Research Council is the largest patent holder related to microstructural and nanotechnology in Canada

Canada				United States			
Organization name	**Type**	**Patent families**	**Share, per cent**	**Organization name**	**Type**	**Patent families**	**Share, per cent**
National Research Council	Government	13	11.25	IBM	Company	126	3.51
Teledyne Dalsa	Company	7	5.78	Invensense	Company	82	2.29
University of Toronto	University	5	4.78	Texas Instruments	Company	73	2.03
Institut National D'optique	Government	5	4.01	HP	Company	69	1.94
McGill University	University	4	3.24	University of California	University	67	1.88
The University of British Columbia	University	3	2.62	Honeywell International	Company	66	1.84
Schlumberger Canada	Company	3	2.23	Intel	Company	58	1.60
Simpler Networks	Company	2	2.02	Analog Devices	Company	56	1.57
University of Alberta	University	2	1.85	Xerox	Company	47	1.30
D-Wave Systems	Company	2	1.68	California Institute of Technology	University	32	0.89
Subtotal	**n.a.**	**45**	**39.47**	**Subtotal**	**n.a.**	**675**	**18.85**
General total	**n.a.**	**113**	**100**	**General total**	**n.a.**	**3,584**	**100.00**

Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Appendix A

Methodology

About the research

This data briefing investigates the concentration of patent ownership in Canada's innovation system by identifying the top 10 patent holders in chemistry and 11 technology classes and comparing their share of total patents with that of their U.S. counterparts. (See Table 1.)

Table 1

Technical descriptions of technology areas in chemistry

Code	Technology	Description
14	Organic fine chemistry	Chemicals related to pharmaceuticals (nearly half of the applications have an additional code in pharmaceuticals), such as pesticides and herbicides, dyes and pigments, flavours and fragrances.
15	Biotechnology	Such as organic chemistry or computer technology, biotechnology is a cross-cutting or generic technology. Mainly genetic engineering, sectoral enzymes, and biofuels.
16	Pharmaceuticals	This field refers to an area of application, not a technology. Medicinal preparations containing inorganic active ingredients.
17	Macromolecular chemistry, polymers	The chemical aspects of polymers.
18	Food chemistry	Represent food additives, preservation methods, flavour enhancers, nutritional supplements. Machines for food production are not included but classified as part of field 29 (other special machines).
19	Basic materials chemistry	Typical mass chemicals such as herbicides, fertilizers, paints, petroleum, gas, detergents, etc.
20	Materials, metallurgy	All types of metals, ceramics, glass, or processes for the manufacture of steel.
21	Surface technology, coating	The coating of metals, generally with advanced methods represents the core of this field. Furthermore, it covers electrolytic processes, crystal growth, and apparatus for applying liquids to surfaces.
22	Microtructural and nanotechnology	Microstructural devices or systems, including at least one essential element or formation characterized by its very small size. It includes nanostructures having specialized features directly related to their size.
23	Chemical engineering	Technologies that are at the borderline of chemistry and engineering. It refers to apparatus and processes for the sectoral production of chemicals. Some of these processes may be classified as physical ones.
24	Environmental technology	A variety of different technologies and applications, in particular filters, waste disposal, water cleaning (a quite large area), gas-flow silencers and exhaust apparatus, waste combustion, or noise absorption walls.

Source: Schmoch.

The central research question is:

How does the concentration of patent ownership within Canada compare with that of the United States across major technology classes, and what do these differences imply for each country's commercialization potential and innovation leadership?

Although Canada and the U.S. differ greatly in the overall scale of their innovation systems, comparing how concentrated patent ownership is within each country provides useful insight. The purpose of this comparison is not to evaluate which country has more patents overall, but to understand the structure of patent ownership inside each national system. Firms ultimately compete globally, but they must first develop scale, capabilities, and market presence in their domestic markets. By examining concentration within Canada and within the U.S.—across the same technology classes—we can assess whether Canada has sufficiently large innovation actors in each domain to support domestic commercialization and, eventually, global competitiveness.

By analyzing both the distribution of patents and the types of entities involved—private firms, universities, government agencies, and individuals—we peer into the structural dynamics of Canada's innovation ecosystem. A higher concentration of patents among top holders typically signals stronger commercialization capacity, which is increasingly recognized as a key determinant of invention value.[1] In contrast, a more diffuse ownership structure may reflect barriers to scaling and market deployment, particularly when patents are held by actors with limited commercialization capabilities.[2] This research builds on previous work[3] mapping Canada's technological strengths by adding a critical layer of analysis—identifying who holds the patents and what that means for Canada's global competitiveness.

Observations in these analyses are on patent families (i.e., European Patent Office worldwide bibliographic data [DOCDB]). A simple patent family is "a collection of patent documents that are considered to cover a single invention. The technical content covered by the applications is identical. Members of a simple patent family have the same priorities."[4]

Detailed methodology

Determining the location of patent holders

Patent holder location in this analysis is determined based on the address provided in patent applications, meaning that branch offices or subsidiaries of multinational companies located in Canada are treated as Canada-based entities. This geographic or jurisdictional designation reflects where the inventive activity originated from, rather than the nationality of the company or the location of its global headquarters. As described below, the PATSTAT Global Database supports this kind of geographic analysis since it removes instances where multiple patents are granted in different jurisdictions for the same patent.

Determining the governmental status of patent holders

We report patent holder names exactly as they appear in patent applications. In cases where multiple government agencies are listed as assignees, we did not aggregate them under a single government category. For example, although the National Research Council is an agency of the Government of Canada, it appears as a separate legal entity in the patent database. We made this choice to reflect how distinct government bodies claim intellectual property rights domestically and internationally. Because patents can be jointly owned in some rare cases, assigning each patent to all listed assignees means that counts within a technology class may sum to more than 100 per cent. This does not affect the underlying interpretation but should be kept in mind when reading concentration figures.

1 Arora and others, "Invention value, inventive capability and the large firm advantage"; and Athreye and others, "Small firms and patenting revisited."
2 Statistics Canada, "Size counts"; and Hsu and others, "Benchmarking U.S. university patent value and commercialization efforts."
3 Sonmez, *Intellectual Property in Canada.*
4 European Patent Office, "DOCDB simple patent family."

Data source

We used PATSTAT Global Database 2024 autumn edition, the same source used in the companion impact paper. PATSTAT enables comprehensive tracking of simple patent families, linking related filings across jurisdictions to eliminate double-counting and provide a consolidated view of inventions. Crucially, PATSTAT includes organizational-level ownership data, allowing us to identify the top patent holders within each technology class and assess their relative concentration. This approach supports a more accurate and jurisdictionally grounded understanding of innovation leadership in Canada.

However, this database comes with a few limitations that affect how the results can be interpreted. First, PATSTAT has an inherent 18-month publication lag, meaning that 2022 is the most recent year with full coverage, 2023 is only partially observed, and records for 2024–25 remain incomplete. Because our analysis relies primarily on fully observed years and focuses on structural patterns rather than exact patent totals, the core findings remain valid; the main implication is simply that point estimates for the latest years may shift modestly downward as the database is updated. Second, PATSTAT links related patents from different countries into families to avoid duplication, and the European Patent Office (EPO) provides detailed coverage information in its *Data Catalogue PATSTAT Global*.[5] However, EPO also notes that ownership data is accurate only to the extent that national offices share change-of-ownership records with it.

Assessing patent ownership concentration for technology classes

Patent ownership concentration

To test the difference between the share of patents held by the top 10 organizations in Canada and the U.S., we employed a two-proportion z-test:

1. Sample parameters

- n_1, n_2 : These represent the total number of patent families (i.e., the sample sizes) within the specific technology field for Canada (n_1) and the United States (n_2).
- x_1, x_2 : These denote the number of patent families held by the top 10 organizations in Canada (x_1) and in the United States (x_2).
- $\hat{p}_1, \hat{p}_2$: These are the observed sample proportions (or shares) of patent families held by the top 10 organizations in each country. The sample proportion is calculated as:

$$\hat{p} = \frac{x}{n}$$

2. Pooled proportion ($\bar{p}$)

The pooled proportion represents the estimated common proportion under the null hypothesis that the two population proportions are equal ($H_0 p_1 = p_2$). It is calculated as:

$$\bar{p} = \frac{x_1 + x_1}{n_1 + n_1}$$

This value combines the observed "counts" from both samples and expresses them as a single weighted average

3. Standard error (SE)

The estimated standard error of the difference between the two independent proportions

$$SE = \sqrt{\bar{p}(1-\bar{p})(\frac{1}{n_1} + \frac{1}{n_2})}$$

4. Test statistic (z)

The z-score measures the number of standard errors the observed difference ($\hat{p}_1$-$\hat{p}_2$) is from zero:

$$z = \frac{\hat{p}_1 - \hat{p}_2}{SE}$$

The z-score quantifies the number of standard deviations the observed difference lies from the null hypothesis (i.e., no difference in proportions), where an absolute value exceeding 1.96 indicates that the difference between the Canadian and U.S. shares is statistically significant at the 95 per cent confidence level.

5 European Patent Office, *Data Catalogue PATSTAT Global*.

Private company dominance rule in the composition of top patent holders

To assess who drives patenting activity within each field, we classify a technology area as private sector–dominated in Canada when seven or more of the top 10 patent holders are private companies. Only when four or more non-private organizations (government entities, universities, or hospitals) appear in the top 10 do we describe the public sector as playing a major role.

Statistical testing for the concentration across 11 technology classes

To evaluate whether the concentration of patent ownership among the top 10 holders differs meaningfully between Canada and the U.S., we conducted a paired sample t-test across 11 technology classes. This statistical test is appropriate because the data is paired by technology class—each class has a corresponding concentration value for both countries.

Statistical framework

- Null hypothesis (H_0): There is no difference in the average share of patents held by the top 10 organizations between Canada and the U.S. across technology classes.
- Alternative hypothesis (H_1): There is a statistically significant difference in the average top 10 patent holder share between the two countries.

Procedure

1. For each of the eleven technology classes, we calculated the share of total patents held by the top 10 organizations in both Canada and the United States.
2. We then computed the difference in concentration for each class (Canadian share minus U.S. share).
3. A paired t-test was applied to determine whether the mean of these differences is statistically significantly different from zero.

Results

- Mean difference: 5.92 percentage points
  (Canadian top 10 holders have a higher average concentration than their U.S. counterparts.)
- p-value: 0.024
  (Statistically significant at the 95 per cent level)

Appendix B

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