

Who Are Canada's Key Instruments Patent Holders?

A Comparative Analysis With U.S. Holders

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Key findings

- Patent ownership in instruments and other technologies is not significantly different between Canada and the United States. On average across eight technology classes, the top 10 Canadian patent holders account for 14.2 per cent of total patents compared with 12.0 per cent in the U.S., a 2.2 percentage point gap that is not statistically significant.
- While Canada shows more public sector participation than the U.S., most technology fields in both countries are dominated by private companies.
- Canada shows higher concentration than the U.S. in measurement and analysis of biological materials. In measurement, Canada's top 10 account for 21.3 per cent of patents compared with 12.0 per cent in the U.S., and in analysis of biological materials, 21.3 per cent compared with 9.9 per cent.
- Invention ownership structure in optics is more fragmented in Canada compared with the United States. Canada's top 10 account for 17.5 per cent of patents compared with 25.7 per cent in the United States. This fragmentation may limit scale-up potential in these areas.
- Industry-driven innovation dominates in control, civil engineering, and consumer goods. In these fields, both Canada and the U.S. top 10 lists are composed almost entirely of private companies, indicating commercially oriented innovation systems in these areas.



Comparing instruments and other technology patent holders

We identify Canada's top 10 patent¹ holders across eight technology classes in instruments and other technology and compare the patent ownership concentration with that of the United States.² Drawing on the analysis of 34,179 patent families for Canada and 907,386 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, it 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 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 A			
Organization B			
Organization C			
Organization D			
Organization E			
Organization F			
Organization G			
Organization H			
Organization I			
Subtotal		N1	P1
General total		N2	P2

Organization name	Type	Patent families	Share, per cent
Organization A			
Organization B			
Organization C			
Organization D			
Organization E			
Organization F			
Organization G			
Organization H			
Organization I			
Subtotal		N3	P3
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

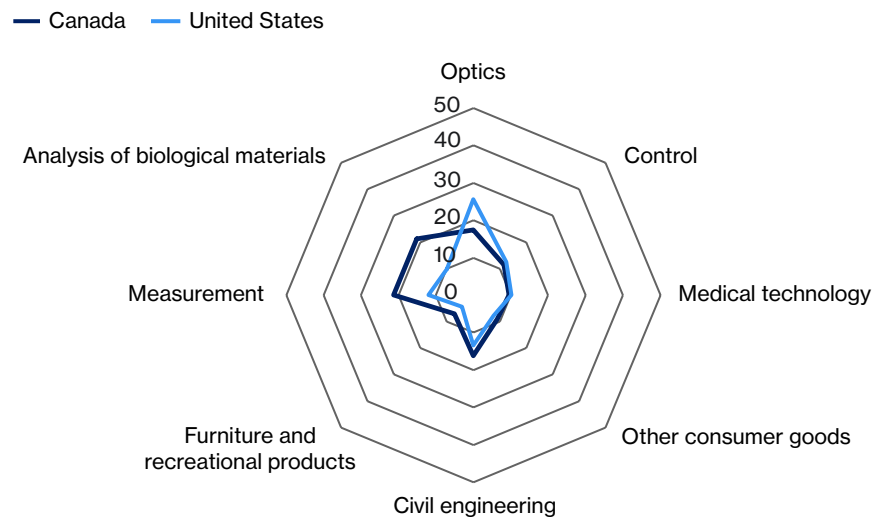
Source: Signal49 Research.

Across instruments and other technologies, patent ownership concentration varies by field. (See Chart 1.) In several areas, Canada and the U.S. exhibit similar levels of concentration. Canada shows higher concentration in fields such as measurement and analysis of biological materials, where a small number of organizations hold a larger share of total patents. In contrast, the U.S. displays higher concentration in optics.

Chart 1

Concentration of patent family ownership in Canada is similar to that in the United States

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

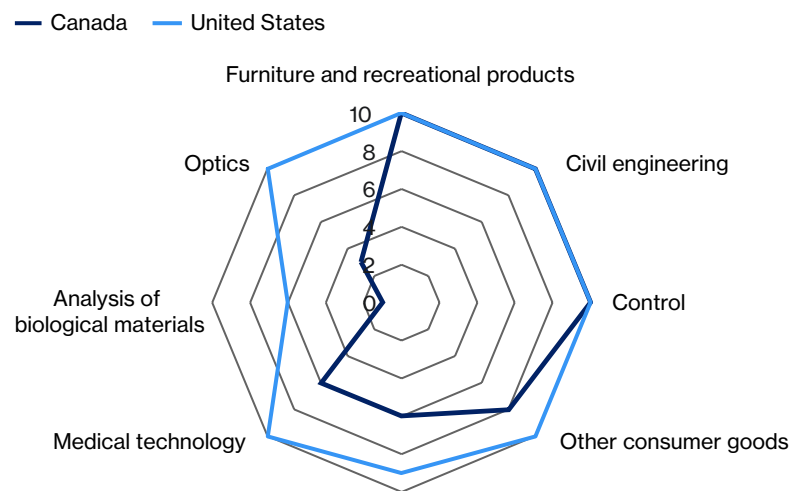


Source: Signal49 Research's analysis of the European Patent Office's *PATSTAT Global patent dataset*, 2024.

Although most technology fields in both countries are dominated by private companies, several fields stand out for having very few private sector organizations in the top 10 in Canada. (See Chart 2.) In areas such as analysis of biological materials, optics, and medical technology, universities, hospitals, and government agencies make up a large share of top patent holders. These fields rely more heavily on public sector research leadership in Canada, making commercialization more dependent on effective pathways for transferring publicly generated intellectual property into industry hands.

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.

Furniture, games, and recreational products

- Canada's top 10 patent holders account for 7.1 per cent of furniture, games, and recreational-product patents, compared with 4.3 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 1.)
- In both countries, the top 10 patent holders are dominated by private companies, reflecting fully industry-driven innovation in this field.



Table 1

Omachron Intellectual Property is the largest patent holder related to furniture and recreational products in Canada

Canada			
Organization name	Type	Patent families	Share, per cent
Omachron Intellectual Property	Company	131	2.49
Bauer Hockey	Company	58	1.11
Spin Master	Company	47	0.90
Whitewater West	Company	38	0.73
V3 Companies	Company	23	0.45
Sport Maska	Company	17	0.32
Evans Consoles	Company	17	0.31
Pollard Banknote	Company	14	0.27
G3 Genuine Guide Gear	Company	13	0.25
Schukra of North America	Company	12	0.23
Subtotal		371	7.05
General total		5,256	100

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

United States			
Organization name	Type	Patent families	Share, per cent
Acushnet Company	Company	954	0.85
Mattel	Company	820	0.73
Whirlpool Corporation	Company	554	0.49
International Game Technology	Company	485	0.43
Callaway Golf Company	Company	477	0.42
Karsten Manufacturing Corporation	Company	382	0.34
L&P Property Management Company	Company	356	0.32
Procter & Gamble Company	Company	277	0.25
Kimberly-Clark Corporation	Company	267	0.24
Nike	Company	241	0.21
Subtotal		4,813	4.28
General total		112,720	100.00

Other consumer goods

- Canada's top 10 patent holders account for 9.1 per cent of other consumer goods patents, compared with 7.7 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 2.)
- In both countries, the top 10 patent holders are dominated by private companies, with Canada also including one government entity and one individual inventor.

Table 2

Bauer Hockey is the largest patent holder related to other consumer goods in Canada

Canada			
Organization name	Type	Patent families	Share, per cent
Bauer Hockey	Company	60	1.92
Camco	Company	37	1.18
Sport Maska	Company	34	1.09
Rothmans, Benson & Hedges	Company	30	0.94
Gillette Canada	Company	25	0.78
Lululemon Athletica Canada	Company	24	0.76
Government of Canada	Government	22	0.70
APR Beauty Group	Company	22	0.69
Cheng, Peter	Individual	18	0.58
California Innovations	Company	13	0.42
Subtotal		285	9.06
General total		3,145	100

United States			
Organization name	Type	Patent families	Share, per cent
Whirlpool Corporation	Company	1,151	1.52
Nike	Company	1,355	1.79
3M Company	Company	619	0.81
GE	Company	546	0.72
R.J. Reynolds Tobacco Company	Company	458	0.61
Haier US Appliance Solutions	Company	398	0.53
Procter & Gamble Company	Company	375	0.50
Colgate-Palmolive Company	Company	334	0.44
Philip Morris	Company	325	0.43
Altria Client Services	Company	254	0.34
Subtotal		5,814	7.69
General total		75,540	100.00

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

Medical technology

- Canada's top 10 patent holders account for 9.5 per cent of medical technology patents, compared with 10.1 per cent in the U.S., indicating similar concentration in both countries. (See Table 3.)
- Canada's top 10 include multiple universities and a hospital, showing a major public sector role, while the U.S. list is entirely composed of private companies.



Table 3

Medtronic Cryocath is the largest patent holder related to medical technology in Canada

Canada			
Organization name	Type	Patent families	Share, per cent
Medtronic Cryocath	Company	89	1.77
Trudell Medical	Company	70	1.40
Synaptive Medical	Company	56	1.13
Johnson & Johnson	Company	45	0.89
Kardium	Company	42	0.83
University Health Network	Hospital	40	0.80
McGill University	University	39	0.77
University of Toronto	University	33	0.66
Western Clinical Engineering	Company	33	0.66
University of British Columbia	University	32	0.63
Subtotal		479	9.54
General Total		5,015	100

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

United States			
Organization name	Type	Patent families	Share, per cent
Medtronic	Company	4,039	1.80
Covidien	Company	3,661	1.63
Procter & Gamble Company	Company	2,420	1.08
Boston Scientific Scimed	Company	2,388	1.06
Ethicon	Company	2,133	0.95
GE	Company	1,988	0.88
Kimberly-Clark Corporation	Company	1,891	0.84
Cardiac Pacemakers	Company	1,518	0.67
Becton, Dickinson & Company	Company	1,486	0.66
Pacesetter	Company	1,271	0.56
Subtotal		22,796	10.13
General Total		224,998	100.00

Control

- Canada's top 10 patent holders account for 11.6 per cent of control technology patents, compared with 12.5 per cent in the U.S., indicating similar concentration in both countries. (See Table 4.)
- In both countries, the top 10 patent holders are dominated by private companies, reflecting an industry-driven innovation landscape in this field.

Table 4

CAE is the largest patent holder related to control in Canada

Canada			
Organization name	Type	Patent families	Share, per cent
CAE	Company	36	1.80
Geotab	Company	28	1.43
Digital Security Controls	Company	28	1.40
Tyco Safety Products Canada	Company	27	1.33
V3 Companies	Company	25	1.23
BlackBerry	Company	22	1.10
Cashcode Company	Company	19	0.93
Visible Assets	Company	18	0.92
Bombardier	Company	15	0.73
IGT Canada Solutions	Company	14	0.68
Subtotal		230	11.55
General Total		1,994	100

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

United States			
Organization name	Type	Patent families	Share, per cent
IBM	Company	1,733	2.42
Honeywell International	Company	1,692	2.36
Boeing Company	Company	832	1.16
GE	Company	830	1.16
International Game Technology	Company	809	1.13
Ford	Company	767	1.07
Pitney Bowes	Company	716	1.00
Texas Instruments	Company	581	0.81
NCR Corporation	Company	516	0.72
Motorola	Company	498	0.69
Subtotal		8,976	12.52
General Total		71,742	100.00

Civil engineering

- Canada's top 10 patent holders account for 16.2 per cent of civil engineering patents, compared with 13.5 per cent in the U.S., indicating higher concentration in Canada, which gives Canada a stronger chance to compete in this field. (See Table 5.)
- In both countries, the top 10 patent holders are dominated by private companies, reflecting industry-driven innovation in this field.

Table 5

Schlumberger Canada is the largest patent holder related to civil engineering in Canada

Canada			
Organization name	Type	Patent families	Share, per cent
Schlumberger Canada	Company	1,036	9.69
Shell Canada	Company	237	2.22
Magna	Company	147	1.37
Evolution Energy Technologies	Company	63	0.59
Packers Plus Energy Services	Company	46	0.43
Cenovus Energy	Company	45	0.42
Dirtt Environmental Solutions	Company	44	0.41
Imperial Oil	Company	43	0.40
Suncor Energy	Company	40	0.38
Stream-Flo Industries	Company	32	0.30
Subtotal		1,733	16.21
General total		10,691	100

United States			
Organization name	Type	Patent families	Share, per cent
Halliburton Energy Services Group	Company	5,280	4.31
Schlumberger Technology	Company	3,033	2.47
Baker Hughes	Company	2,715	2.21
Caterpillar	Company	1,663	1.35
Smith International	Company	803	0.65
Weatherford/Lamb	Company	697	0.57
Halliburton Company	Company	682	0.56
Shell Oil Company	Company	605	0.49
Weatherford Technology Holdings	Company	598	0.49
Mobil Oil Corporation	Company	427	0.35
Subtotal		16,503	13.45
General total		122,621	100.00

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

Optics

- Canada's top 10 patent holders account for 17.5 per cent of optics patents, compared with 25.7 per cent in the U.S., indicating lower concentration in Canada, which may limit commercialization and scale-up in this field. (See Table 6.)
- Canada's top 10 include multiple government and university organizations, showing a major public sector role, while the U.S. list is dominated by large corporations.

Table 6

Institut national d'optique is the largest patent holder related to optics in Canada

Canada			
Organization name	Type	Patent families	Share, per cent
Institut national d'optique	Government	95	5.37
National Research Council	Government	59	3.31
Government of Canada	Government	45	2.52
Imax Corporation	Company	27	1.54
Laval University	University	17	0.95
University of British Columbia	University	17	0.94
University of Ottawa	University	13	0.73
Belden Canada	Company	13	0.71
University of Toronto	University	12	0.70
Creo	Company	12	0.69
Subtotal		309	17.46
General total		1,773	100

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

United States			
Organization name	Type	Patent families	Share, per cent
Kodak	Company	8,410	8.33
Xerox	Company	6,575	6.51
3M Company	Company	2,099	2.07
IBM	Company	2,272	2.25
HP	Company	1,328	1.31
Corning	Company	1,257	1.24
Lucent Technologies	Company	1,116	1.11
Polaroid	Company	1,106	1.09
Dupont	Company	910	0.90
Intel	Company	851	0.84
Subtotal		25,925	25.65
General total		101,011	100.00

Measurement

- Canada's top 10 patent holders account for 21.3 per cent of measurement patents, compared with 12.0 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 several public sector organizations (government and research institutes), showing a major public sector role, while the U.S. list is dominated by large private corporations.

Table 7

Schlumberger Canada is the largest patent holder related to measurement in Canada

Canada				United States			
Organization name	Type	Patent families	Share, per cent	Organization name	Type	Patent families	Share, per cent
Schlumberger Canada	Company	528	9.49	GE	Company	3,605	2.03
Government of Canada	Government	142	2.55	IBM	Company	3,060	1.73
National Research Council	Government	139	2.50	Honeywell International	Company	2,995	1.69
Institut national d'optique	Government	80	1.43	Government of the United States of America	Government	2,655	1.50
Novatel	Company	65	1.17	Schlumberger Technology	Company	2,036	1.15
Hydro-Québec	Government	55	0.99	Boeing Company	Company	1,876	1.06
Shell Canada	Company	54	0.97	Texas Instruments	Company	1,454	0.82
Synaptive Medical	Company	42	0.76	Halliburton Energy Services Group	Company	1,351	0.76
Pratt & Whitney Canada	Company	41	0.74	Agilent Technologies	Company	1,122	0.63
BlackBerry	Company	37	0.67	Raytheon Company	Company	1,103	0.62
Subtotal		1,182	21.26	Subtotal		21,258	11.99
General total		5,562	100	General total		177,292	100.00

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

Analysis of biological materials

- Canada's top 10 patent holders account for 21.3 per cent of patents related to the analysis of biological materials, compared with 9.9 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.)
- Canada's top 10 include universities, government institutions, and a hospital, showing a major public sector role, while the U.S. list is largely dominated by private companies.

Table 8

University of British Columbia is the largest patent holder related to analysis of biological materials 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	22	2.96	University of California	University	380	1.77
University of Alberta	University	20	2.66	Abbott	Company	319	1.49
University of Toronto	University	18	2.40	Harvard University	University	290	1.35
McGill University	University	18	2.39	Becton, Dickinson & Company	Company	257	1.20
McMaster University	University	18	2.37	Miles Laboratories	Company	200	0.93
National Research Council	Government	17	2.22	Roche Diagnostics Operations	Company	170	0.79
Government of Canada	Government	15	1.98	Kodak	Company	140	0.65
Schlumberger Canada	Company	14	1.87	Beckman Coulter	Company	135	0.63
University Health Network	Hospital	11	1.48	University of Texas	University	131	0.61
University of Montreal	University	7	1.01	Government of The United States of America	Government	111	0.52
Subtotal		159	21.33	Subtotal		2,132	9.94
General total		743	100	General total		21,462	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 instruments and other technologies and eight 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 instruments and other technologies

Code	Technology	Description
9	Optics	All parts of traditional optical elements and apparatus, but also laser beam sources.
10	Measurement	A broad variety of different techniques and applications related to the measurement of mechanical properties (e.g., length, oscillation, speed).
11	Analysis of biological materials	The analysis of blood for medical purposes. In many cases, biotechnological methods are addressed.
12	Control	Elements for controlling and regulating electrical and non-electrical systems and referring test arrangements, traffic control, or signalling systems.
13	Medical technology	Generally associated with high-technology items such as medical imaging devices, surgical instruments and robotics, diagnostic and monitoring equipment, and therapeutic devices, but also low-technology items such as as operating tables, massage devices, bandages, etc.
33	Furniture, games, and recreational products	Consumer products such as adjustable ergonomic office chairs, modular transformable furniture, interactive gaming tables.
34	Other consumer goods	Primarily represents less research-intensive products such as kitchen appliances, personal care products, household-cleaning devices.
35	Civil engineering	The construction of roads and buildings as well as elements of buildings such as locks, plumbing installations, or strongrooms for valuables. A special part refers to mining which is important for Canada.

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 work³ 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:

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

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

3. Standard error (SE)

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

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

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 nonprivate 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 eight 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 8 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 eight 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: 2.23 percentage points
(Canadian top 10 holders have a slightly higher average concentration than their U.S. counterparts)
- p-value: 0.337
(Not statistically significant)

Appendix B

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