Fig. 2

CONTEXT MATTERS

Strengthening the Impact of Foreign Investment on Domestic Innovation

ICTC CTIC

Research by

The Information and Communications Technology Council

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Preface

The Information and Communications Technology Council (ICTC) is a not-for-profit, national centre of expertise for strengthening Canada's digital advantage in a global economy. Through trusted research, practical policy advice, and creative capacity-building programs, ICTC fosters globally competitive Canadian industries enabled by innovative and diverse digital talent. In partnership with an expansive network of industry leaders, academic partners, and policy makers from across Canada, ICTC has empowered a robust and inclusive digital economy for over 25 years.

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Executive Summary

The relationship between intellectual property (IP) development, retention, and commercialization and foreign direct investment (FDI) is a key priority for Canadian innovators and policymakers. FDI is one way to bring new capital, infrastructure, labour, and ideas to Canada. The relative contribution of IP intensive industries to national economies has risen internationally, and IP provides one lens through which to study the impact of FDI on Canadian innovation, R&D, and business ecosystems. This study finds that while FDI and IP are sometimes directly related, such as in the purchase of strategic IP or the development of IP as part of FDI, the actions of foreign multinational enterprises (FMNEs) and Canadian companies in such circumstances are much more likely to be determined by other incentive structures such as market access, cost and availability of talent, private investment opportunities, or R&D subsidies. Furthermore, the impact of FDI on Canadian innovation and IP depends on technology subsector, local business density, type of FDI, and other considerations.

This paper takes two approaches to examining the impact of FDI on IP in Canada. It looks at the role of key variables in FNME and Canadian innovator decision-making (including market size, talent, private investment, and government regulation and funding). Simultaneously, it presents three case studies from very different technology subsectors—medical devices; carbon capture, utilization, and storage (CCUS); and artificial intelligence (AI). First, the key variables show that there are structural elements at play in Canadian innovation that guide the relationship between FDI and IP, and that strengthening the Canadian innovation ecosystem requires addressing the underlying structural barriers to domestic IP retention and commercialization. Second, the three case studies illustrate that not all technology and innovation in Canada is impacted by FDI in the same way: location and business density, availability of domestic capital, scale-up costs and infrastructure, and whether FNMEs are investing horizontally or vertically (via procurement) all mediate outcomes for Canadian innovation.

Key Variables in FNME and Canadian Innovator Decision-Making:

Market Size, Critical Mass, and Maturity

While Canada has a small population, business ecosystem, and final consumption expenditure (FCE) compared to its advanced peer countries, it provides an export platform for foreign investors: Canada has 15 trade agreements with 51 countries and enjoys proximity to the United States. Market size has several impacts on IP and FDI:

- Many businesses register IP outside of Canada. In 2018, only 16% of Canadian patents in force globally were in force in Canada—while not a concern in and of itself, this may indicate which markets Canadian companies regard as important and competitive
- Canada must promote FDI attraction mechanisms in addition to market access while strengthening Canadian business density to improve market access plays. Foreign investors can play a role in this through ecosystem development programs and incentives
- Canadian businesses have an opportunity to forge strategic partnerships (such as procurement relationships) with foreign investors, utilizing their expanded markets. However, they must also be IP literate, mindful of early exit potential and its likelihood in different types of partnerships
- Canadian businesses may be acquisition driven because a comparatively small domestic market makes it challenging to scale

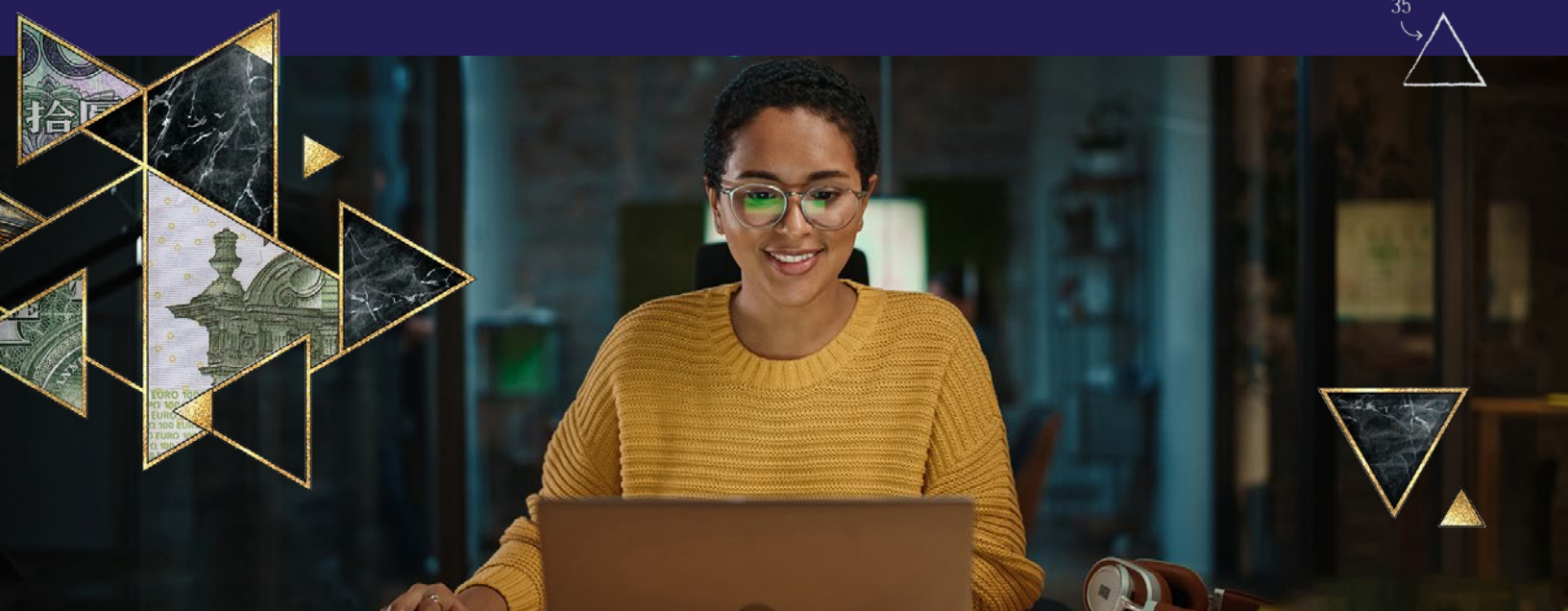
Talent

Talent is a major lever in FDI attraction, supporting domestic innovation and IP development.

- As measured by proportion of adults with tertiary education, Canada has the most highly educated workforce in the OECD. Highly educated technology personnel are less costly in Canada than in countries like the U.S., in part due to the value of the Canadian dollar. This is a key aspect of FDI attraction in many Canadian cities, and may be significantly impacted by the expansion of remote work.
- However, there is a dearth of seasoned business and entrepreneurial talent in Canada, in part because entrepreneurs may move their companies to another country to scale their businesses (see findings in market, mass, maturity, and private investment). As illustrated in the paper's medical devices case study, some business ecosystems have begun to develop sufficient density and critical mass to retain and foster senior business talent.

Foreign companies in Canada act as an important training ground for Canadian tech and business talent, but wages can also cause problems for Canadian startups trying to compete. For example, median base salaries of most FMNEs and Canadian companies in Vancouver are similar for software engineers, developers, and designers (about $70,000). But for the "big five" tech giants (Google, Amazon, Meta, Apple, and Microsoft), the median is approximately $114,220. The upside is high paying jobs for Canadian workers, but the downside is higher labour costs and higher competition for talent during labour shortages. Moreover, big-name FDI may draw more talent to a city, reversing the entrepreneurial brain drain, but the expansion of remote work may result in employers being located in different countries or regions than their employees.

Talent and IP overlap: "IP" can include staff with important subject matter or institutional knowledge. For talent-based IP to remain in an ecosystem, there must be sufficient critical mass and business density to absorb former employees of FMNEs, pay competitive salaries, and prevent them from moving to other jurisdictions.



Talent flow in an ecosystem is discussed in the first case study, involving medical device companies in the Greater Toronto Area (GTA). It concludes that local talent in the medical device industry is dynamic, and the paths taken by senior talent following an M&A are diverse. In some companies, senior talent moved mostly to other local startups post acquisition, while in others, talent only moved to other FMNEs. In just under half of all companies, senior talent went on to become founders themselves, creating 14 new companies locally. In the medical device field, both Canadian companies and greenfield investors help create a valuable training ground for local talent.

Private Investment, Exit Planning, and Acquisitions

As a new company looks for startup or scale-up capital, it has several options, including government funding, personal investment, venture capital (VC), incubators, institutional investors, or business development funding from a bank or private partner.

- While seeking international investment might result in a company leaving Canada, it also gives that company access to more experienced partners and bigger markets
- Patents may affect valuation or help companies attract funding, although not universally. For example, a patent may act as a proxy for maturity for companies that have yet to generate revenue or first buyers
- Cultural and social factors (such as national pitching strategies and gender) play into successfully attracting investment, and future research would benefit from a GBA+ (gender-based analysis plus) analysis of investment in technology companies in Canada
- Canadian VCs may push a company to aim for an earlier acquisition than American VCs. Canadian companies take longer to obtain their first round of financing, go through fewer rounds of financing overall, and raise less money before exiting
- Similarly, there is a dearth of capital for scaling a business in Canada. Startups that wish to scale must often learn to seek capital abroad, move their sales or business abroad, or sell
- Increased retention of Canadian-owned companies as they scale will contribute to domestic IP retention, job growth, business density and maturity, and innovation potential in the long run. Acquirers are frequently foreign because there are few large companies in specific technology subsectors in Canada. Some acquired companies stay in Canada as a local subsidiary, while others are transplanted.

  While M&As are not necessarily negative, increased retention of Canadian-owned companies as they scale will contribute to domestic IP retention, job growth, business density and maturity, and innovation potential in the long run.

CASE STUDY II

Even in the energy sector, where Canada has an advantage, CCUS startups and scale-ups often need to look abroad for larger investors as they grow. Energy sector companies procuring CCUS technology to meet environmental, social, and governance (ESG) requirements or carbon targets are more likely to help a company scale their technology and access international markets than a large technology sector competitor looking for strategic IP. Accordingly, greenfield FDI has an important role to play in strengthening Canada's CCUS ecosystem through procurement, vertical knowledge spillovers that build entrepreneurial experience, and new market access.

Government Regulation

Trends in regulation can influence company decisions to develop and commercialize IP in Canada, scale, move, or take an early exit.

- Highly regulated sectors in Canada (such as healthcare, financial services, and clean technology) and their procurement policies mediate the ability of Canadian startups to grow domestically, as does regulatory stability and consistency
- Patent boxes were mentioned in some interviews as a possible mechanism for FDI attraction and business density enhancement
- The Investment Canada Act provides two processes for federal review of FDI: a national security review and a net benefit review. In recent years, the Investment Canada Act has been under debate, and this paper provides a synthesis of the perspectives on the net benefit review

CASE STUDY III

The final case study on public funding in Canada's AI ecosystem explores the relationship between IP and FDI in the high technology subsector. For a sample of 209 Canadian AI startups, it concludes that being acquired or bought out is a common form of exit, with companies being acquired more often by FMNEs than Canadian companies; a greater percentage of companies that were acquired by a FMNE held at least one patent filing at the time of exit; and for companies that had been bought out or acquired at exit and received public funding, those acquired by an American company (as opposed to Canadian) received on average of almost twice the amount of public funding.

Government Financing and Innovation Infrastructure

While interviewees felt that scale-up capital was not readily available in Canada, nor (for some) adequate seed funding, many interviewees mentioned being helped by government grants and incentives, including the National Research Council of Canada Industrial Research Assistance Program (NRC IRAP) and the Scientific Research and Experimental Development (SR&ED) tax credit. This paper provides a map of available federal innovation funding (over $500,000) and the degree to which these programs consider Canadian status as part of their funding criteria.

Canadian R&D funding is frequently used by FDI attraction agencies to attract greenfield investment in Canada. University IP commercialization offices, accelerators, university departments, and not-for-profit institutes also play a role in FDI attraction by forging R&D partnerships or licensing agreements. At least two distinct perspectives on this type of partnership exist: one, that FDI partnerships for R&D produce and commercialize IP in Canada; the other, that such partnerships result in an exodus of Canadian IP without adequate commercialization opportunities at home.

Six key questions can lend nuance to this debate:

1. **In any R&D arrangement, who retains the rights to the IP that is created?**

   There are a variety of existing arrangements—sometimes a FMNE retains exclusive rights, sometimes they are shared, and sometimes a Canadian researcher or lab retains the IP.

2. **When, where, and how is that IP commercialized?**

   This involves a series of trade-offs for all stakeholders. For example, a university might commercialize IP by transferring rights to a FMNE in exchange for a new research lab, jobs, and prestige. Alternatively, a company might commercialize its IP by manufacturing and selling a product, minimizing a customers' negotiating power (for example, where the customer needs access to the company's IP in order to manufacture a product), or creating barriers to entry for key competitors. International tax planning further complicates this issue, as FMNEs may primarily commercialize their IP in a subsidiary or a head office in another country. At the heart of this debate is whether IP retained domestically stimulates greater long-term growth than IP transferred to foreign parties operating in Canada.

3 **How prepared are Canadian researchers and startups to meaningfully commercialize their IP?**

IP literacy extends beyond understanding when to protect IP or file for a patent, to business skills, securing freedom to operate, dealing with competition, and being able to negotiate an appropriate deal. These skills are not widespread in Canada.

4 **Without support from a foreign multinational enterprise (FMNE), what parties would purchase or scale Canadian IP?**

A highly IP-literate Canadian company might still encounter the challenges of a small market and inadequate capitalization. Two potential answers to this issue are, improved mechanisms for purchasing and scaling IP, and/or, strategic partnerships with FMNEs where IP is scaled without triggering an acquisition.

5 **What goals and side effects of FDI/university partnerships are there to consider other than IP?**

Open source tools, data science communities, new assets for a university, entrepreneurial experience, jobs, and/or international relations are all positive outputs of R&D partnerships. An analysis of a partnership's contribution to Canada should include all outcomes.

6 **What countries are we competing with to attract FDI, and how do our incentive structures compare?**

Some interviewees suggested tying R&D funding to IP retention requirements. This could mean, for example, a requirement that if IP is developed in Canada under a specific funding program and then transferred to a foreign entity, the original grant funding must be repaid. Numerous interviewees, however, noted that any changes to R&D funding structures might result in less FDI business activity in Canada, or indeed that Canada already pales in comparison to competing nations.

In sum, these questions ask whether it is contradictory to support Canadian IP development, retention, and commercialization while keeping Canada an attractive place to do business for international players. This paper contends that both can be supported via a strengthened Canadian innovation ecosystem, with attention to business density, entrepreneurial experience, improved capitalization, and better IP commercialization literacy for Canadian researchers and entrepreneurs.

SECTION I

Background

Canada's technology sector and economy as a whole are impacted by numerous variables, including market size, access to capital, quality of life, and education and talent at Canadian schools and universities. To strengthen the Canadian economy, policymakers have the challenging task of identifying appropriate variables and indicators such as innovation, well-being, prosperity, and others. It is no simple feat to determine the most effective way to measure and promote such subjective values on a broad scale. This paper seeks to contribute to this task with an in-depth examination of two variables at play in the Canadian economy: foreign direct investment (FDI) and intellectual property (IP)—and the relationship between the two.

Section I provides a background to each of these concepts and their importance to the Canadian economy and technology sector. It outlines existing research into the relationship between FDI and IP, setting up this paper's objectives and methodology.

Section II examines factors that mediate the relationship between FDI and IP in Canada's economy and innovation ecosystem. The study concludes with an analysis of strengths, weaknesses, opportunities, and threats (SWOT) for Canada based on the findings.

Introduction to Intellectual Property

IP is both a **legal term** that refers to creations of the mind and a **business term** that describes several types of intangible assets. Alongside other intangible assets like data, organizational routines, production processes, and business relationships, IP is a key component of modern economies. Private sector indexes show that intangible assets have an increasing impact on business valuations,[1] while international studies find that industries with above average use of IP rights are associated with higher wages, and contribute more to GDP and exports per worker than non-IP intensive industries.[2] International studies also find that the relative contribution of IP intensive industries to national and global economies has risen over time.[3] Finally, in Canada, research shows that holding formal IP and having a higher awareness of IP is associated with higher firm growth, market expansion, and success in attracting financing.[4]

From the legal perspective, IP is an invention, design, or artistic work that can be protected using IP rights (IPRs). In Canada, there are five main types of IPRs,[5] which are governed by a collection of Act[6] and the Canadian Intellectual Property Office (CIPO).[7] Together, these Acts and CIPO help to ensure that businesses operating in Canada can protect their IP and profit financially from their work. CIPO works with other international and national IP offices[8] to coordinate protections filed in Canada by international companies and protections filed abroad by Canadian companies. To date, several international treaty agreements have been reached to help facilitate IP applications to multiple IP offices simultaneously.[9] **Table 1** provides an overview of the five main types of IPRs in Canada. Notably, these protections are not mutually exclusive: one may be used to protect an innovation, or many may be used to protect a single innovation simultaneously.

1 Alexandra Cutean et al., "Bolstering Growth: The Next Frontier for Canadian Startups," Information and Communications Technology Council, 2020, https://medium.com/digitalthinktankictc/bolstering-growth-44707bb09bb0; That said, the value that IP provides varies and will depend on a company's maturity, business model, and sector. See: Kasznik, E., "Examining the Correlation Between IP and Startup Valuations," February 2020, Business Valuation Update, https://www.bvresources.com/blogs/intellectual-property-news/2020/02/24/examining-the-correlation-between-ip-and-startup-valuations

2 "IP and the US Economy," September 2016, USTPO, https://www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf; "IPR-intensive industries and economic performance in the European Union," September 2019, EU Intellectual Property Office, https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IPContributionStudy/IPR-intensive_industries_and_economicin_EU/WEB_IPR_intensive_Report_2019.pdf; "Use of Intellectual Property rights across UK industries," September 2020, UK Intellectual Property Office, https://www.gov.uk/government/publications/use-of-intellectual-property-rights-across-uk-industries/use-of-intellectual-property-rights-across-uk-industries#use-of-registered-ip-rights-across-uk-industries

3 "IP and the US Economy," September 2016, USTPO, https://www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf; "IPR-intensive industries and economic performance in the European Union," September 2019, EU Intellectual Property Office, https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IPContributionStudy/IPR-intensive_industries_and_economicin_EU/WEB_IPR_intensive_Report_2019.pdf; Cadestin, C. et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

4 "Canada IP Report," 2019, Canadian Intellectual Property Office, https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/vwapj/IP_Canada_Report_2019_eng.pdf/$file/IP_Canada_Report_2019_eng.pdf

5 Patents, industrial designs, trademarks, and copyrights, which are formally regulated by government, and trade secrets, which are governed using private sector contracts.

6 Including the Patent Act, Trademarks Act, Copyright Act, Industrial Design Act, Integrated Circuit Topography Act, Canada–United States–Mexico Agreement Implementation Act, Criminal Code

7 A special operating agency of Innovation, Science and Economic Development Canada

8 Such as the United States Patent and Trademark Office (USPTO), World Intellectual Property Organization (WIPO), and European Intellectual Property Office (EUIPO).

9 Namely, the Patent Cooperation Treaty (PCT) for patents, Madrid System for trademarks, and Hague System for industrial designs. The PTC enables applicants to file for patents in up to 153 member countries through a single international application; the Madrid System enables applicants to file for trademark registration in up to 123 countries through a single international application; and the Hague System enables applicants to file for industrial design registration in up to 91 countries through a single international application.

Type & example	What does it apply to?	What legal right does it provide?	Is formal registration required?	How long does it last?
Patents  EXAMPLE Secure and Portable EV Charger	Newly developed inventions (processes, machines, products, or compositions of matter); and improvements on existing products or processes.	The legal right to exclude others from making, using, or selling an invention.	**Yes.** Patents must be applied for and registered with CIPO.	A patent lasts for 20 years from the date that you file it.
Industrial Designs  EXAMPLE Apple Watch	The visual features of a product, including the shape, configuration, pattern, and/or ornament. Must be original/ not closely resemble other IDs.	The legal right to exclude others from making, using, or selling a design.	**Yes.** Industrial Designs must be applied for and registered with CIPO.	A registered industrial design receives protection for up to 10 years.
Trademarks  EXAMPLE "Timbits"	A combination of letters, words, sounds, or designs that distinguish one company's goods or services from those of others in the marketplace.	The exclusive right to use the trademark in Canada. Prevents misuse of the trademark by others.	**Yes and no.** (depending on the length of its use) Using a trademark for a certain length of time garners automatic rights under common law.	A trademark receives protection for 10 years and can be renewed every 10 years.
Copyright  EXAMPLE The written code of a software program	Creative works, including literary, artistic, dramatic, or musical works (including computer programs) and other subject matter known as performer's performances, sound recordings, and communication signals.	The exclusive right to produce or reproduce a work (or a substantial part of it) in any form; and license that work.	**No.** Copyrights can be registered, however, the legal rights associated with new artistic works exist intrinsically from the moment they are created.	A copyright lasts for the length of the creator's lifetime and for 50 years following their death.
Integrated Circuit Topographies (ICTs)  EXAMPLE A company's microchip	New ICTs: 3D configurations of electronic circuits embodied in integrated circuit products or layout designs.	The exclusive right to reproduce a topography or manufacture an integrated circuit product that incorporates it; and license it.	**Yes.** ICTs must be applied for and registered with CIPO.	An ICT lasts for up to 10 years from the original filing date or first commercial exploitation.
Trade Secrets  EXAMPLE The CocaCola Recipe	Any valuable business information that derives its value from secrecy. For example: sales methods, distribution methods, customer profiles, client lists, supplier lists, product ingredients, etc.	Provides secrecy and any additional protections provided for in private legal agreements.	**No.** They are instead protected though private legal agreements (non-disclosure agreements, confidentiality clauses), criminal law, and technical solutions (encryption, passwords).	Being unregulated, there is no specific length of protection for trade secrets.

Table 1: Types of IP and IP protections. Based on information taken from the CIPO and ISED websites. Government of Canada, 2016.

Data source: "Understand the Basics," CIPO, 2016, https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/wr03585.html?Open&wt_src=cipo-ip-main

IP's Role in Innovation Research

IP is thought by many researchers to reflect innovative activity: the improvement of existing products and services, or the creation of new products and services that bring value to a company and economy. International and national IP offices make IP registration data available for the IPRs they regulate, which makes IP registration data a readily available resource for researchers. However, when conducting research on IP and innovation, it is important to consider that not all innovation is reflected in registered IP data. As is shown in **Table 1**, not all IP is formally regulated by government: while patents, industrial designs, trademarks, and copyrights, are formally regulated, trade secrets[10] are not. Nor are intangible assets like data, business relationships, or entrepreneurial expertise. Also, for a number of reasons, not all businesses choose to register their IP. Studies by the European Intellectual Property Office[11] and Statistics Canada[12] identify several reasons for not registering IP: lack of knowledge about IP, financial cost of IP protections, wanting the innovation to be available to anyone, assets not being "innovative enough," no perceived benefit of IP protections, and difficulties enforcing IP rights. Due to underrepresentation of women in the IP field, gender and identity may also impact whether an inventor, founder, or CEO chooses to register their IP.[13]

A second consideration is that there are numerous types of IP indicators. IP offices collect data about **IP applications** (the number of applications that are filed in each jurisdiction), **grants** (the number of applications that are successful and thus result in a grant), and **the number of grants in force** (the number of active grants in a jurisdiction at any given time).[14] IP grants (e.g., patent, trademark, and industrial design grants) account for a relatively small portion of the total applications. This is partially explained by processing delays and because not all applications are examined immediately, and not all IP is granted (e.g., they are rejected).[15] Each of these indicators has built in assumptions, so research findings may different depending on which indicators are used.

10 Jenna Ross, "Intangible Assets: A Hidden but Crucial Driver of Company Value", February 11, 2020, Visual Capitalist, https://www.visualcapitalist.com/intangible-assets-driver-company-value/

11 "2019 Intellectual Property SME Scoreboard," October 2019, EUIPO, https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IP_sme_scoreboard_study_2019/IP_sme_scoreboard_study_2019_en.pdf

12 "Intellectual Property Awareness and Use Survey, 2019," February 18, 2021, Statistics Canada, https://www150.statcan.gc.ca/n1/daily-quotidien/210218/dq210218b-eng.htm

13 Myra Tawfik & Heather Pratt, "Study of the underrepresentation of women and women-identifying IP-rights holders, company founders, and senior leadership," 2021, University of Windsor, https://www.ipcollective.ca/wp-content/uploads/2021/12/Study-on-Women-in-IP-ENG.pdf

14 The grant data generally trails the application data due to processing delays within IP offices: in Canada for example, it takes approximately 33.6 months for a patent application to be processed. See: "Annual Report 2017-2018," January 31, 2019, CIPO, https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/wr04473.html

15 For example, on average, from 2000 to 2018, grants accounted for approximately 45% of the total patent applications. Within Canada, from 2000 to 2018, trademark registrations accounted for approximately 56% of the total applications filed, whereas abroad, this figure was 76%.

A third consideration is whether formally registered IP is a reliable proxy for innovative activity. A company's intangible assets tend to correlate positively with domestic and international expansion and high growth at the company and national levels; however, some scholars on the topic dispute the existence of any causal relationship.[16] For example, a wealthier company might be both more likely to scale up and expand, and more likely to be able to afford the fees and process of registering formal IP. In this case, financial resources may be the more important variable. Alternatively, a company that offers innovative services may rely heavily on data, employee know-how, and expertise but hold no patents. This debate—and the variations between and within countries,[17] company size,[18] business models,[19] and sectors[20]—warrants further investigation into the nature of the relationship between the IP, innovation, and company success.

IP Activity in Canada by Sector

The relative importance of IP to businesses in different sectors remains relatively unexplored in Canada. However, Statistics Canada recently conducted the first Canadian survey[21] on this topic, asking some of the following questions:

- Did this business seek information, guidance or advice on patents, trademarks, or other types of intellectual property?
- Which of the following types of intellectual property does this business own: patents, industrial designs, copyrights, trademarks, integrated circuit topographies, plant breeder's rights?
- How important was business IP to the following activities: research and development, innovation, product development, securing funds from external investors, etc.?[22]

16 "We suggest another – and so far undertheorized—explanation of the links between IP and growth: that IP may have few direct effects on growth and that any causality is a result of belief rather than actual deployment of IP." E. Richard Gold, Jean-Frédéric Morin, and Erica Shadeed, "Does intellectual property lead to economic growth? Insights from a novel IP dataset," Regulation and Governance Vol 13 (1), March 2019, pp. 107-124.

17 Amina Ahmed Lahsen & Alan T. Piper, "Property rights and intellectual property protection, GDP growth and individual well-being in Latin America," Latin American Economic Review Vol 28, November 2019.

18 "In Canada, small to medium sized enterprises (SMEs) that are knowledgeable about IP—including methods for securing their IP—progress better than SMEs that are not, while those that report holding formal IP (patents, trademarks, copyrights, and industrial designs) progress better still. In 2017, SMEs holding formal IP were three times more likely to have expanded domestically than SMEs with little or no knowledge of IP. They were also four times more likely to have expanded internationally and nearly two times more likely to have experienced high growth (at least 20% growth per year) in the previous three years. Patents may also increase the likelihood of venture capital (VC) funding by 'alleviating concerns regarding a startup's ability to monetize its invention.' IP and data—protected via patents, trademarks, copyrights, and designs—form the core of this value, and businesses that lead in IP development are increasingly competitive in the global arena." Alexandra Cutean et al., "Bolstering Growth: The Next Frontier for Canadian Startups," Information and Communications Technology Council, 2020, https://medium.com/digitalthinktankictc/bolstering-growth-44707bb09bb0

19 Efrat Kasznik, "Examining the Correlation Between IP and Startup Valuations," February 2020, Business Valuation Update, https://www.bvresources.com/blogs/intellectual-property-news/2020/02/24/examining-the-correlation-between-ip-and-startup-valuations

20 "Survey of Intellectual Property Awareness and Use (IPAU)," February 18, 2021, Statistics Canada, https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=1228833

21 Ibid.

22 "Survey of Intellectual Property Awareness and Use," November 23, 2020, Statistics Canada, https://www.statcan.gc.ca/eng/statistical-programs/instrument/5291_Q1_V1

The sectors most likely to have sought IP advice are businesses operating in clean technology (24.2%), the information and cultural industries (21.6%), manufacturing (18.1%), wholesale trade (16.6%), and information and communications technologies (ICT) (11.3%). Most commonly, businesses that sought IP advice were either seeking funding for IP protection (48.4%) or seeking to identify what their IP was (38.6%). Just over a quarter of those who sought advice were considering protecting their IP abroad (27.8%). Similarly, businesses operating in the information and cultural industries (47.8%), clean technology industries (47.8%), manufacturing (32.6%), wholesale trade (31.0%), and ICT (25.2%) were most likely to own at least one type of IP. Of these sectors, ICT, clean technology, and manufacturing businesses were most likely to report that their IP contributed positively to business performance, such as increased employment, revenues, or business value.

Overall, ICT businesses see IP as more important to R&D and innovation than other types of enterprises. When asked how important was your businesses' IP to R&D, innovation, and securing investment (from 2017-2019), ICT businesses valued the former two more highly than other industries, as illustrated in **Figure 1**. Interestingly, clean technology businesses did not feel that IP was important to securing investment. While few ICT businesses felt that IP was "very important" to securing investment, more than half thought IP held at least some importance. In comparison, only about a third of all surveyed businesses felt that IP was at least somewhat important to securing investment.

A growing number of countries internationally have conducted research to identify which of their industries are IP intensive (defined as IP expenditure or IP holdings per employment).[23] Generally, this research finds industries in the following sectors IP intensive: information and cultural industries; utilities, professional, scientific and technical services; finance and insurance; manufacturing; wholesale trade, and mining, quarrying, and oil and gas extraction. Across all sectors, IP and intangible capital feature more prominently in the business models of multinational companies, however, the way knowledge is created and how intangible assets are incorporated into business models varies.[24] As more industries incorporate data, software, and electronic components into their products and services, investment returns to IP and other intangible capital will increase: for example, the OECD observes this trend in the automotive industry.[25]

23 "Activities of multination enterprises in Canadian and foreign multinationals, by sector and industry: Table 36100604," 2021, Statistics Canada, https://open.canada.ca/data/en/dataset/ba4b40be-8f08-4910-b4ba-8557676a0c81;"Intellectual Property and the U.S. Economy: 2016 Update," September 2016, Economics and Statistics Administration and the United States Patent and Trademark Office, https://www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf; "IPR-intensive industries and economic performance in the European Union," September 2019, European Union Intellectual Property Office, https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IPContributionStudy/IPR-intensive_industries_and_economicin_EU/WEB_IPR_intensive_Report_2019.pdf; "Use of Intellectual Property rights across UK industries," September 2020, UK Intellectual Property Office, https://www.gov.uk/government/publications/use-of-intellectual-property-rights-across-uk-industries/use-of-intellectual-property-rights-across-uk-industries#use-of-registered-ip-rights-across-uk-industries

24 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

25 Ibid.

Location of Headquarters

From 2017-2019, how important was IP to R&D, innovation, and investment?

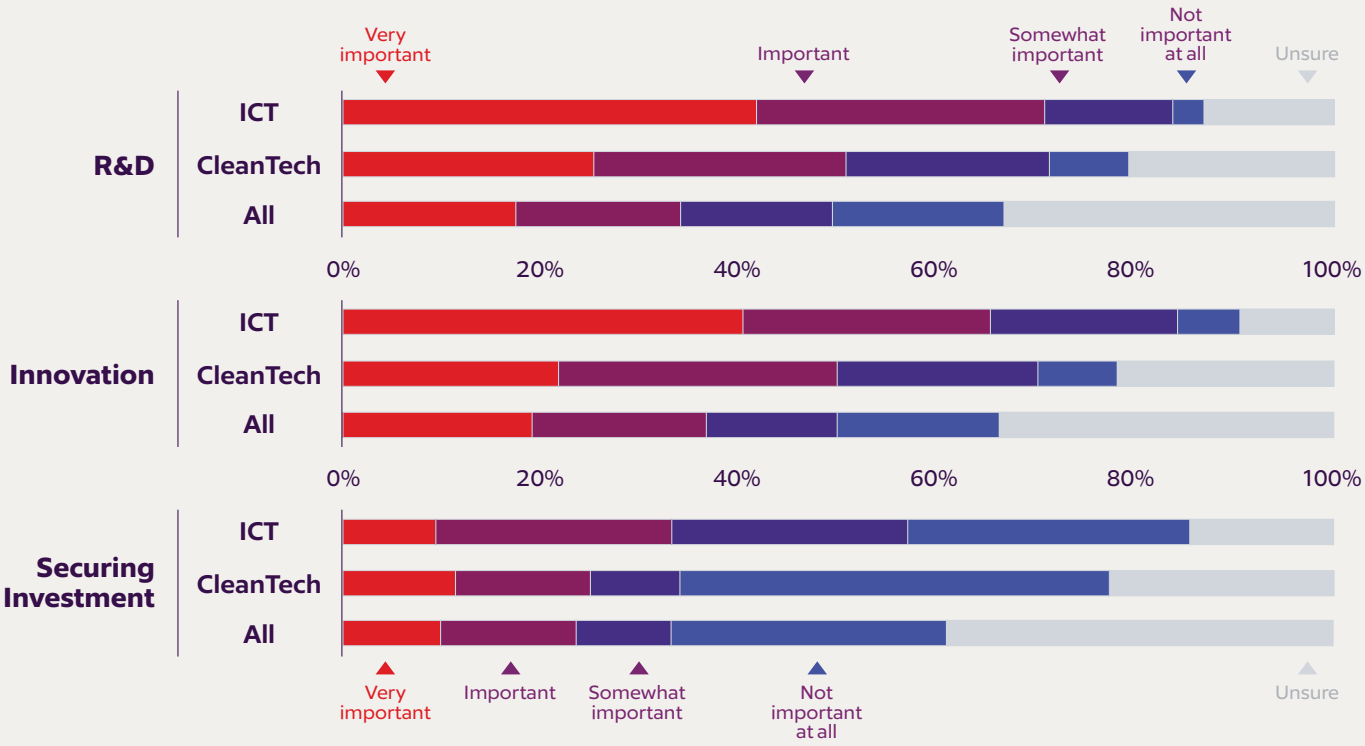


Figure 1: Importance of IP to R&D, innovation, and investment among Canadian business.
Data source: Statistics Canada Survey of Intellectual Property and Use, 2019.

Introduction to Foreign Direct Investment

Foreign direct investment (FDI) is a type of cross-border capital movement. To qualify as a foreign direct investor, an organization must establish a lasting and significant interest in the business activities of the foreign company in which it invests (and thus in the economy of another country). The OECD has assigned a minimum definition of lasting and significant interest: FDI occurs when an entity in one economy acquires, "either directly or indirectly, at least 10% of the voting power of a corporation (enterprise) or equivalent for an unincorporated enterprise, resident in another country."[26]

Individuals, public or private enterprises, and government bodies, among other types of organizations, can all engage in FDI.[27] In addition, FDI can take various forms, including mergers and acquisitions, where an entity takes over an existing company and its assets or two companies merge; brownfield investment, where a company expands and reinvests; or greenfield investment, where an entity opens new operations or facilities.[28]

26 Organisation for Economic Co-operation and Development (OECD), *Glossary of Foreign Direct Investment Terms and Definitions*, n.d.
27 Ibid.
28 Organisation for Economic Co-operation and Development, *OECD Benchmark Definition of Foreign Direct Investment*. P. 31.

FDI has many characteristics that distinguish it from other types of cross-border capital flows: not least, multinational enterprises must have a reason to establish a presence in another country rather than simply exporting goods and services. Many economists use the Ownership-Location-Internalization (OLI) framework,[29] which proposes that MNEs[30] consider the following when engaging in FDI:

- The MNE's ownership advantages (such as assets, international client base, skills, knowledge, IP, or entry to a new industry) that improve its competitiveness in the host country
- The location advantages of the host country, including production costs, transportation costs, financial and tax legislation, trade barriers, access to local markets, access to natural resources or specific technologies or knowledge
- The cost of internalizing production (through a subsidiary or branch plant in a host country) rather than shipping or licensing assets to local enterprises in the host country[31]

For example, internalizing production in a host country may be advantageous if there are high tariffs or trade costs preventing profitable export. Internalizing production may also be advantageous in sectors like financial services or healthcare, which often require companies to be established domestically.[32] Similarly, low labour costs or large market access in a host country might attract FDI.[33]

More relevant to IP, a country's IP protections may help an MNE decide if they feel safe licensing a patent to a producer in a host country, or if they need to create their own production facilities to protect their IP more stringently. Also related to IP, MNEs may engage in FDI in order to acquire knowledge and reduce risk. MNEs will establish subsidiaries in key places of interest in order to "tap into place-specific knowledge pools," monitor new technological trends, and "limit the risk of a deterioration of the MNE's position relative to the technological frontier."[34] Finally, while FDI is related to financial incentives, it also has other dimensions: it establishes a relationship between host and home countries, with variables such as cultural similarity, language, and labour mobility comprising important considerations.[35] As illustrated by interviewees, many business decisions emerge from interpersonal relationships, professional networks, and quality of life.

29 First conceived by John H. Dunning in *Multinational Enterprises and the Global Economy* (1993) the OLI framework has since provided a starting point for many economists seeking to understand FMNE decision-making.

30 In this paper, MNE is used to refer to any Multinational Enterprise. A FMNE is specifically a foreign MNE in Canada or elsewhere. A Canadian **MNE** is specifically a Canada-based MNE. A Canadian company is a Canada-based company that is or is not an MNE.

31 Sucharita Ghosh and Steven Yamarik, "Do the Intellectual Property Rights of Regional Trading Arrangements Impact Foreign Direct Investment? An Empirical Examination," International Review of Economics & Finance 62 (July 1, 2019): 180–95, https://doi.org/10.1016/j.iref.2019.03.002.

32 Cadestin, C. et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

33 Keith E. Maskus, "The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer Symposium: Public and Private Initiatives After Trips," *Duke Journal of Comparative & International Law* 9, no. 1 (1999 1998): 109–62.

34 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

35 Jordi Paniagua and Juan Sapena, "Is FDI Doing Good? A Golden Rule for FDI Ethics," Journal of Business Research 67, no. 5 (May 1, 2014): 807–12, https://doi.org/10.1016/j.jbusres.2013.11.049

Types of FDI and Canada's FDI Composition

FDI is an important component of Canada's economy. International financial integration improves the stability of local economies, in part because FDI brings new capital into a host economy, subject to economic forces distinct from those of the host country.[36] For example, the Bank of Canada has suggested that Canada's participation in globalization helps insulate the economy from shocks, with the caveat that excessive foreign inflows into debt generates vulnerabilities (as opposed to a large equity stake, which most FDI is).[37] In addition, several studies have found that FDI to developed financial economies (e.g., the OECD in aggregate) stimulates GDP growth.[38, 39]

To understand the role of FDI in Canada's technology sector, it is important to understand the different types of FDI and their various motivations and attraction methods.

FDI is **horizontal** when an entity establishes or acquires a similar operation in another country. This could be motivated by market access (to gain easy access to a large market in the host country for one's product or service) or to avoid trade frictions (e.g., if there are high tariffs or transportation costs and building parallel operations to distribute from a country is less expensive).[40]

Vertical FDI occurs when an entity establishes or acquires a different type of activity in another country—often to produce (backward vertical) or distribute (forward vertical) goods and services. This might be motivated by lower labour costs in a host country, for example.[41] However, contemporary MNE integration strategies are often too complex to fall into a clear divide:

> *Large multinationals invest in low-cost countries to create export platforms from which they serve other countries around the world, and the large flows of FDI across industrial countries cannot be satisfactorily classified as horizontal FDI.* [42]

36 Keith E. Maskus, "The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer Symposium: Public and Private Initiatives After Trips," *Duke Journal of Comparative & International Law* 9, no. 1 (1999 1998): 109–62.

37 Gabriel Bruneau, Maxime Leboeuf, and Guillaume Nolin, "Canada's International Investment Position: Benefits and Potential Vulnerabilities," Bank of Canada (June 2017).

38 John Anderson and Dylan Sutherland, "Developed Economy Investment Promotion Agencies and Emerging Market Foreign Direct Investment," *Journal of World Business* 50, no. 4 (October 2015): 815-825.

39 Patricia Higino Schneider, "International Trade, Economic Growth and Intellectual Property Rights: A Panel Data Study of Developed and Developing Countries," Journal of Development Economics 78, no. 2 (December 1, 2005): 529–47, https://doi.org/10.1016/j.jdeveco.2004.09.001.

40 Marco Fugazza and Claudia Trentini, "Empirical Insights on Market Access and Foreign Direct Investment," *United Nations: Policy Issues in International Trade and Commodities*, no. 63 (2014).

41 Ibid.

42 Elhanan Helpman, "Trade, FDI, and the Organization of Firms," Journal of Economic Literature 44, no. 3 (September 2006): 589–630, https://doi.org/10.1257/jel.44.3.589.

International trade agreements play some role in this complexity, creating the opportunity for third countries to offer broader market access—this is known as **export-platform FDI**.[43] This is highly relevant to Canada, as it can serve as an export-platform to the United States (via the United States-Mexico-Canada Agreement [USMCA], formerly NAFTA) and many other countries through its numerous trade agreements. Furthermore, an internationalized value chain has resulted in **complex vertical FDI**, where MNEs minimize production costs by selecting many host countries specialized in different stages of production.[44]

Fugazza and Trentini (2014) found that **inter-OECD FDI does not, in aggregate, fall clearly into any of the above four categories.** They posit:

> *This could find an explanation in the fact that investments among OECD countries are mainly driven by mergers and acquisitions, and investment motivations can change considerably from the traditional ones listed above and include competition reduction, technology transfer, economies of scale, and coordination of production and marketing decisions.* [45]

This observation about inter-OECD FDI is key for Canada, as most of Canada's inward FDI comes from OECD peer countries. Statistics Canada reports on the percentage of FDI stock[46] held in Canada by ultimate investing country (UIC), which reflects the fact that FMNE governing structures are complex, and that "immediate" and "ultimate" investing countries may not be the same.[47] Overall, **82%** of UIC FDI Stock in Canada is held by other OECD countries, and half of all FDI Stock in Canada is held by the United States (see **Table 2**).[48]

43 Marco Fugazza and Claudia Trentini, "Empirical Insights on Market Access and Foreign Direct Investment," United Nations: Policy Issues in International Trade and Commodities, no. 63 (2014): 35

44 Fugazza and Trentini.

45 Fugazza and Trentini.

46 FDI stock or positions "provide information on the total stock of investment made abroad and received from abroad, broken down by instrument (equity, debt) for a given reference date.... FDI position data allow a structural analysis of investments in the host economy or industry sector, and investment by the investing (home) country or industry sector." Organisation for Economic Co-operation and Development et al., OECD Benchmark Definition of Foreign Direct Investment.

47 Global Affairs Canada, "State of Trade 2021 - A Closer Look at Foreign Direct Investment (FDI)," Global Affairs Canada, February 2, 2021, https://www.international.gc.ca/transparency-transparence/state-trade-commerce-international/2021.aspx?lang=eng.

48 Statistics Canada. Table 36-10-0433-01 International investment position, foreign direct investment in Canada by ultimate investor country (x 1,000,000)

Composition of FDI Stock in Canada by Country: Top 10 UICs

Ranking	UIC	FDI Stock (billions)	FDI Stock Share	OECD Member?
1	United States	$523	50.0%	✓
2	United Kingdom	$64	6.1%	✓
3	Japan	$48	4.6%	✓
4	Germany	$34	3.3%	✓
5	Switzerland	$34	3.2%	✓
6	China	$32	3.1%	
7	Netherlands	$31	3.0%	✓
8	Ireland	$25	2.4%	✓
9	Brazil	$24	2.3%	
10	France	$24	2.3%	✓

Table 2: Composition of FDI Stock in Canada by Country: Top 10 UICs. **Data source:** Statistics Canada, 2021.[49]

Accordingly, it is essential to treat any analysis of FDI in Canada with granularity: relying on generalized conclusions about all types of FDI from and to all types of countries may not adequately capture FDI attraction and outcomes in Canada. A country-by-country (and indeed, sector-by-sector) exploration should also consider whether FDI in this space is concentrated in vertical supply-chains, horizontal operations, R&D shops, export-platform plays, or some combination of the above? This paper will explore this topic through three technology subsector case studies involving different types of FDI.

FDI Activity in Canada by Sector

In 2020, the following sectors accounted for the greatest share of FDI into Canada: management of companies and enterprises (24%), manufacturing (19%), and mining and oil and gas extraction (18%), followed closely by finance and insurance (13%), and wholesale trade (9%).[50] Over the last 20 years, FDI activity in the management of companies and enterprises sector has increased at a faster rate than any other sector: in 2018, this sector accounted for a greater share of total FDI than manufacturing for the first time.

49 Global Affairs Canada, "State of Trade 2021 - A Closer Look at Foreign Direct Investment (FDI)," Global Affairs Canada, February 2, 2021, https://www.international.gc.ca/transparency-transparence/state-trade-commerce-international/2021.aspx?lang=eng. Data retrieved April 27, 2021 from Statistics Canada, Table 36-10-0008-01, Table 36-10-0433-01.

50 "International investment position, Canadian direct investment abroad and foreign direct investment in Canada, by industry and select countries, annual," Jun 18th, 2021, Statistics Canada, https://open.canada.ca/data/en/dataset/7856a6e4-9157-413f-a907-431008627584

The management of companies and enterprises sector is heavily populated by holdings companies, which own controlling interests in other companies but do not produce any products or services themselves. Because holdings companies indirectly support other sectors, they obfuscate sector-level FDI data.

Like IP and FDI activity, the relationship between FDI and IP likely varies by sector and industry. Software, computer systems, and communications service companies account for 94% of ICT companies in Canada, 88% of the ICT sector's direct impact on Canadian GDP, and 84% of the ICT sector's direct impact on Canadian employment.[51] This makes intangible assets like software and data a foundational part of economic activity in ICT.[52] Meanwhile, the manufacturing sector uses technology to produce and sell tangible goods and is therefore highly related to patents, trademarks, and industrial designs. FDI composition in these sectors also varies, with investors seeking resources, manufacturing capacity, and/or R&D support. For example, a company or investor operating in manufacturing versus retail trade is subject to different FDI and IP needs.

Contribution to Total Stocks FDI by Sector 2020

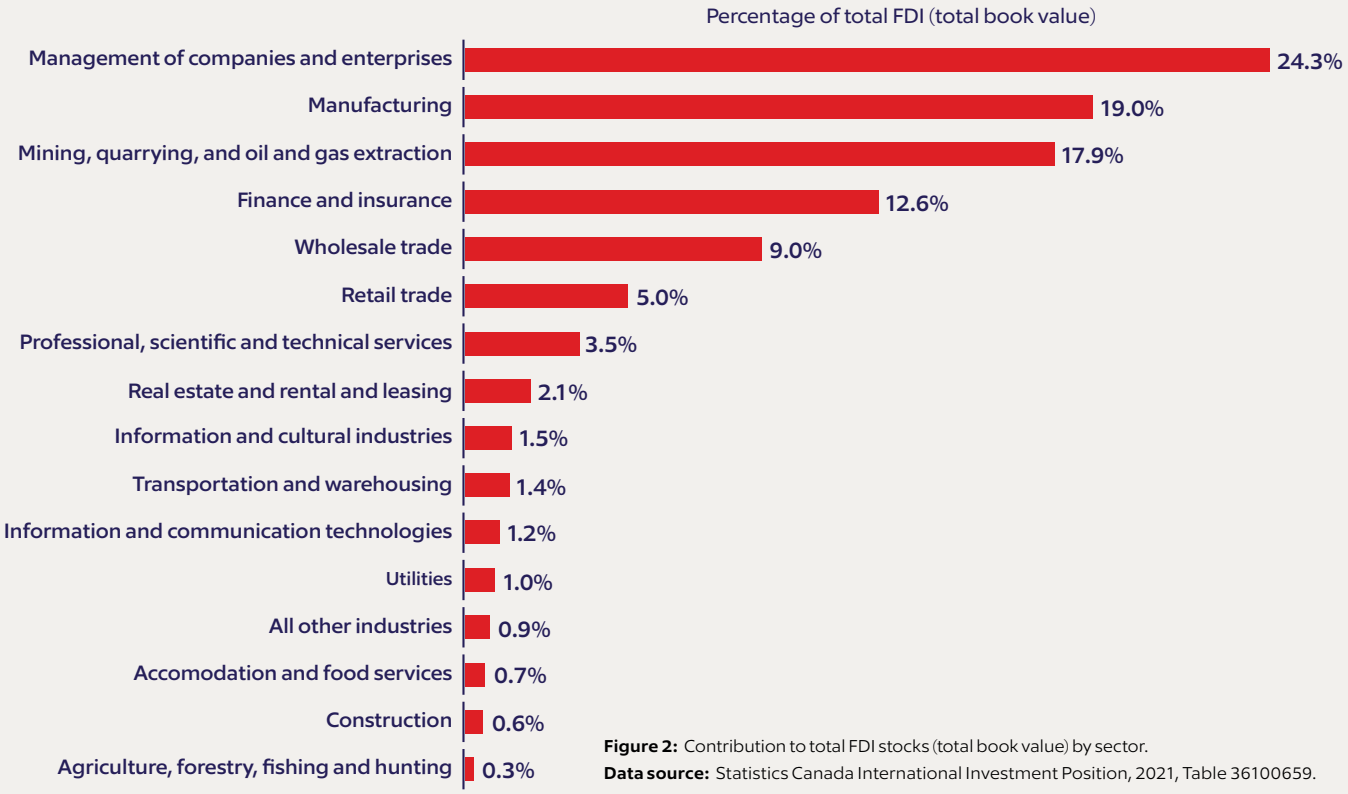


Figure 2: Contribution to total FDI stocks (total book value) by sector.
Data source: Statistics Canada International Investment Position, 2021, Table 36100659.

51 "Canadian ICT Sector Profile 2020," July 13 2021, Government of Canada, https://www.ic.gc.ca/eic/site/ict-tic.nsf/eng/h_it07229.html; Nancy Gallini and Aidan Hollis, "To sell or scale up," August 2019, *IRPP*, https://irpp.org/wp-content/uploads/2019/08/To-Sell-Or-Scale-Up-Canadas-Patent-Strategy-in-a-Knowledge-Economy.pdf

52 "In companies where technology is the most valuable asset (usually correlated with heavy investment in research and development, such as pharma and biotech), patents can have more value compared to companies where the brand is the main asset (consumer products, as an example). Similarly, in companies where data are deemed to be the most valuable asset (as is the case in many software companies), patents may have less value as the preferred mode of protection, since patents cannot protect data. The underlying assets that bring value, such as brand or data, are often not subject to patent protection and are better protected by other types of IP." See: Kasznik, E., "Examining the Correlation Between IP and Startup Valuations," February 2020, Business Valuation Update, https://www.bvresources.com/blogs/intellectual-property-news/2020/02/24/examining-the-correlation-between-ip-and-startup-valuations

Why Study the Relationship Between FDI and IP?

Canadian policymakers and many businesses care deeply about strengthening Canada's innovation economy. FDI is one way to bring new capital, infrastructure, labour, and ideas to Canada. IP provides one lens through which to study the impact of FDI on Canadian innovation, R&D, and business ecosystems. As will be explored throughout this paper, many stakeholders suggest that Canadian IP and R&D attracts FDI; however, while some stakeholders see this as having a positive impact on Canada's innovation ecosystem, others see it as cause for concern. For example, some have noted:

- "Canada's understanding and approach to inbound tech FDI remains rooted in the industrial era understanding of the role and impact of FDI," and that an exact opposite approach to FDI is being taken by successful innovation economies around the world[53]
- Many Canadian inventors sell or reassign their patents to entities outside of Canada, and because of this, "Canadian invention too often does not result in Canadian ownership of patented technologies"[54]
- The success of our publicly funded education systems and strong talent has been limited to creating "technology that we allow foreign companies to swoop in, commercialize, and then charge us to use"[55]
- Certain kinds of FDI may play an "extractive" role and that it may be "time to rethink our foreign investments strategies"[56]

There are questions related to IP and FDI that need to be addressed, such as: "How should Canada's approach to FDI change in the age of intangibles? What new Criteria and metrics should be used to evaluate foreign investment?"[57] These concerns are rooted in a longstanding debate over the role of FMNEs in local economies. This debate features "traditionally quite opposing views, going from ones highly critical of FMNEs to others instead commending MNE activities."[58] It invokes a range of highly politicized themes, including power, ownership, tax evasion, and lobbying.

This study uses a mixed methods approach to examine the relationship between FDI and IP in Canada, with a particular focus on *technology and technology-enabled industries*. It explores:

- The impact of FDI on IP development, commercialization, and retention in Canada, for both MNEs and Canadian companies seeking to start up and scale

53 Dan Ciuriak, "Industrial-era Investment Strategies Won't Work in a Data-driven Economy", November 15, 2018, *CIGI*, https://www.cigionline.org/articles/industrial-era-investment-strategies-wont-work-data-driven-economy; Dan Ciuriak, "The Knowledge-based and Data-driven Economy: Quantifying the Impacts of Trade Agreements," December 2017, *Centre for International Governance Innovation*, CIGI Papers No. 156.; Dan Ciuriak, "Rethinking Industrial Policy for the Data-driven Economy," October 2018, Centre for International Governance Innovation, CIGI Papers No. 192.

54 Nancy Gallini and Aidan Hollis, "It's too expensive and complicated to retain patents. But helping innovator to do it would help drive Canada's growth and competitiveness.", September 24, 2019, *Policy Options*, https://policyoptions.irpp.org/magazines/september-2019/why-do-foreign-firms-own-so-many-patents-on-canadian-inventions/

55 James Hinton, "Canada needs to own critical IP and data assets to inspire generational economic prosperity," March 2020, *CIGI*, https://www.cigionline.org/articles/canada-needs-own-critical-ip-and-data-assets-inspire-generational-economic-prosperity/

56 Robert Asselin and Sean Speer, "A New North Star: Canadian Competitiveness in an Intangibles Economy", April 2019, *Public Policy Forum*, https://ppforum.ca/wp-content/uploads/2019/04/PPF-NewNorthStar-EN4.pdf

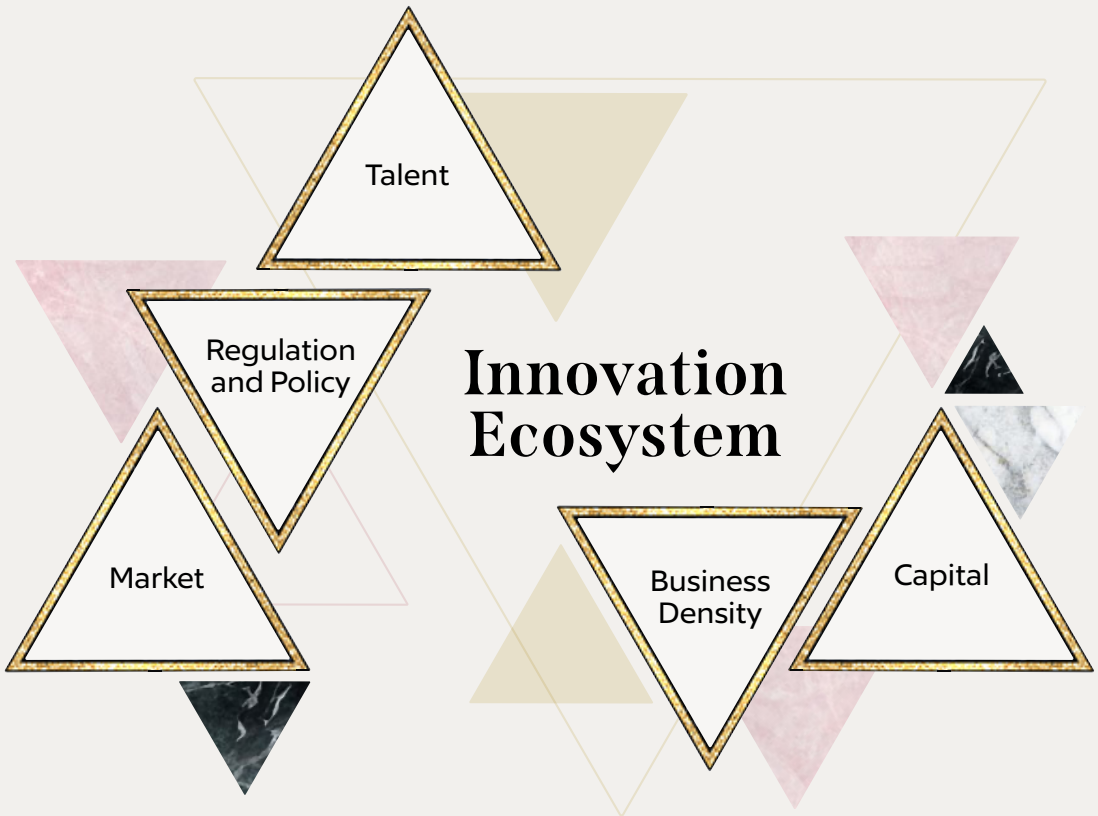
57 Daniel Munro and Creig Lamb, 'The Intangible Shift: Changing Gears to Compete in the New Economy", January 2020, *Brookfield Institute*, https://brookfieldinstitute.ca/wp-content/uploads/The-Intangible-Shift-ONLINE-1.pdf, p. 24.

58 "Multinational enterprises in the global economy Heavily debated but hardly measured," May 2018, *OECD*, https://www.oecd.org/industry/ind/MNEs-in-the-global-economy-policy-note.pdf

- The impact of IP and R&D on FDI attraction
- The role of FDI & IP in shaping a strong Canadian innovation ecosystem, and opportunities for growth

It seeks to understand FDI attraction and impacts from a holistic perspective and is based in 43 interviews with diverse stakeholders: foreign investors; Canadian companies that are attempting to conduct R&D, attract funding, commercialize IP, and scale; and policymakers, educators, and others working at the high-level intersection of these topics.

The study shows that while FDI and IP are sometimes directly related, such as in the purchase of strategic IP or the development of IP as part of FDI, the actions of MNEs and Canadian companies in such circumstances are much more likely to be determined by other incentive structures, such as market access, cost and availability of talent, private investment opportunities, or R&D subsidies. As is explored in Section II, these act together in a complex Canadian innovation ecosystem that presents unique constraints and opportunities.



By examining FDI and IP in Canada, policymakers can take away key opportunities to strengthen the country's innovation ecosystem for all parties. This study concludes with a SWOT analysis that presents strengths, weaknesses, opportunities, and threats for Canadian innovation ecosystem to consider.

SECTION II

Innovation Ecosystem

A country's innovation ecosystem includes domestic and multinational businesses, R&D groups, universities, investors, government funders and regulators, accelerators, and many other players. FDI is an important input in this ecosystem, as international companies contribute technological and business expertise and capital to a host economy, often while creating jobs. IP is concurrently an important output. In general, Canadian interviewees working in FDI attraction and IP commercialization wanted to maximize capital inflows and knowledge transfer while also ensuring optimal development, retention, and/or commercialization of Canadian IP. Both of these priorities are essential to a vibrant innovation ecosystem. Host countries can benefit from spillovers, such as technological progress or the accumulation of intangible capital in FMNEs, however, spillovers are not automatic.[59] According to the OECD, a strong domestic innovation ecosystem can both attract FMNEs and FDI to the local economy and increase the local innovation ecosystem's "absorptive capacity" for spillovers.[60] Accordingly, while the primary focus of this study is FDI and thus international investors operating or considering operating in Canada, this paper examines the experiences of both Canadian and foreign companies in Canada's innovation ecosystem, how the two impact each other, and how both FDI and Canadian IP development respond to stimuli such as venture capital (VC) availability or government regulation.

59 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, *OECD*, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

60 Ibid.

Consider for a moment the experience of this hypothetical Canadian company and FMNE:

Company A is a medical device startup spun out of a university in Ontario by a small team of academic researchers. The team completes a successful clinical investigation, secures $750,000 in government funding to build a commercial prototype, and identifies potential partners to work with to build out their supply chain and manufacturing process. They try to identify initial customers and finalize their supply chain and manufacturing partnerships but begin to encounter challenges. The founding team is made up of seasoned academic researchers, but it lacks private sector experience and is unfamiliar with how to grow a business and secure customers and funding. They originally thought that Canada, with its large healthcare sector, was an ideal market, but soon find that the Canadian hospitals they wanted to sell to have tight budgets with little discretionary funding for new tech. The team pivots and begins establishing relationships with hospitals across the United States. With a new go-to-market strategy in place, they pursue private sector funding. Again, the team encounters challenges. They have little experience pitching to VCs and negotiating deals, and find it hard to communicate to VCs what their product does and why it is valuable. They are offered several funding opportunities with inadequate terms before landing a modest deal with a Canadian investor who requires that they hire a new CEO with business experience and plan for a five-to-10-year acquisition exit strategy. Over the next six years, they land several high-profile clients in the United States and build out their supply chain and manufacturing process while continuing to invest in R&D and incrementally improving their medical device. While some of the founding members want to scale the business and start selling their product overseas, others want to sell the business and focus on new projects. They struggle to find new funding and after discussions with their initial investors, decide to sell.

Company B is multinational company that spans several life sciences industries: pharmaceuticals, biotech, medical devices, and hospital software solutions. They first began operating in Canada in the 1990s when they opened a manufacturing plant for medical devices in the GTA. Over time, their presence in Canada grew: the company was attracted by Canada's strong healthcare sector, universities, and talent, as well as available federal and provincial R&D tax credits and other public funding opportunities. Company B is an active player in the life sciences innovation ecosystem. They regularly partner with Canadian universities and hospitals and create local, high paying jobs. Following their annual strategic planning meeting, Company B decides it wants to enter a new segment of the medical device industry. After weighing their options (build a new product line internally or make a strategic acquisition), they decide to go the route of a strategic acquisition. They identify a Canadian company with the right technology portfolio and talent, and after a successful round of negotiations, acquire it. Whether they will keep the talent, office, manufacturing, or IP in Canada is not yet decided: their primary goal is to scale production and sell to key markets in East Asia and the European Union.

Scenarios like those of Company A and Company B lead some to fear that Canadian IP rarely stays in Canada, while others view it as a positive sign of lasting investment in Canadian jobs and technologies. In either case, both companies are acting in understandable ways based on incentives and pressures from clients, talent, and investors. This section explores specific aspects of the innovation ecosystem that structure the relationship between FDI and IP in Canada: Canada's market size, talent, private investment, and government support. It ends with a SWOT analysis of how the ecosystem can be strengthened to encourage both Canadian innovation and FDI.

Market Size, Critical Mass, and Maturity

> *We need to put a Canadian lens on and ask, where do we actually have leadership strengths? And I'm not thinking so much about university experts in artificial intelligence. I'm thinking more in the application of technologies, our major industries that are going to be first buyers and movers. Because ultimately, that is where you create the most wealth, where technology and innovation companies are able to stick to the jurisdiction they get started in because they have lots of customers and clients.*
>
> – Clean technology sector organization in Canada

> *We're selling a lot of stuff into the Toronto area and having success. But we will very quickly run out of accounts to sell to.*
>
> – Financial company technology in Canada

> *You need a complete ecosystem for a company to stand itself upright. You need capital, people who know about your industry—you don't want mining people investing in medical technology because they don't understand it. You want value-added investors, I guess you could say. You want to be able to hire marketing people with 30 years of experience in your field. They're not living in Moose Jaw. You need like 10 different kinds of experts, and then 50 people to populate your R&D team.*
>
> – Medical technology company in Canada

Few investors considering Canada are likely to come here for its market. With its comparatively small population, business ecosystem, final consumption expenditure, and GDP, Canada typically relies on other qualities to attract FDI (with the exception of some large and Fortune 500 companies expanding into large Canadian cities to access new urban markets, or companies that are making export-platform plays). Similarly, many Canadian businesses seek out U.S. or other markets as destinations for their goods and services (which makes it even more important that they prioritize IP protections[61]).

As the quotations above suggest, there are several large industries in Canada that can act as large initial buyers of technology company goods and services—for example, natural resources companies procuring carbon-reducing technologies. The mining, quarrying, and oil and gas extraction sector contributes $156,791 million to Canadian GDP but has a relatively low number of enterprises (8,733, the lowest by far of any other sector) suggesting that there are large companies with procurement needs in this group. Canada's highly educated talent, R&D subsidies, regional trade agreements, political stability, and cultural proximity to business partners are all reasons why businesses—Canadian or foreign—might choose to stay here. Nevertheless, many interviewees voiced a desire to see a more mature and better populated innovation ecosystem in Canada, including more companies of all sizes,[62] more ambitious procurement strategies, and more mature business expertise in technology subsectors. Market size, maturity, business culture, and the "critical mass" of the innovation ecosystem are at the root of many trends in FDI and IP in Canada.

Canadian Industries: GDP and Number of Enterprises

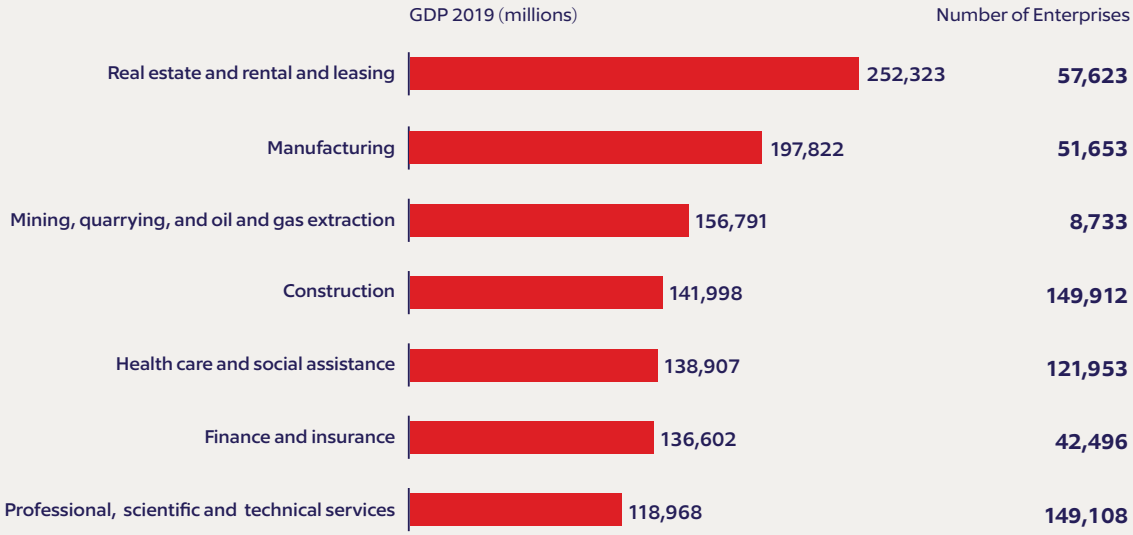


Figure 3. Data source: Statistics Canada. Table 36-10-0434-06 Gross domestic product (GDP) at basic prices, by industry, annual average, industry detail (x 1,000,000), https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610043406 and Statistics Canada. Table 33-10-0222-01 Canadian Business Counts, with employees, December 2019, https://doi.org/10.25318/3310022201-eng

61 Catherine Beaudry, "What if we stopped playing second fiddle in terms of innovation," October 2021, The Hill Times, https://www.hilltimes.com/2021/10/25/what-if-we-stopped-playing-second-fiddle-in-terms-of-innovation/323387

62 More businesses necessarily requires more Canadians to choose a career in entrepreneurship: according to some commentators, Canada lacks entrepreneurial spirit and has a low number of entrepreneurs per capita. See: Abu-Hakima, S., "innovation nation equals entrepreneurship nation: a story from a successful entrepreneur," October 2021, The Hill Times, https://www.hilltimes.com/2021/10/25/innovation-nation-equals-entrepreneurship-nation-a-story-from-a-successful-entrepreneur/323419

Population, GDP, Financial Consumption Expenditure (FCE), and the number of domestic businesses are all useful indicators of market size, however, in comparison to the other countries in the G7, Canada ranks the lowest in all four criteria. Despite ranking more favourably in some population-adjusted indicators, such as GDP per capita, Canada still has a low business density. When compared to other countries with similar population sizes, such as Australia, France, and the UK, Canada has a low number of small and large businesses per 1000 population (see **Figure 4**). →

The United States is included in this chart for comparison, but the large difference between the U.S. and Canadian populations makes comparison less meaningful.

The Impact of a Smaller Market on the Canadian Business Ecosystem

Many businesses choose to file their IP with the United States Patent and Trademark Office (USPTO) instead of in Canada with the Canadian Intellectual Property Office (CIPO). Businesses may also move sales or business development activities to the U.S. or source executive talent from the U.S. This may lead to an entrepreneurial brain drain.

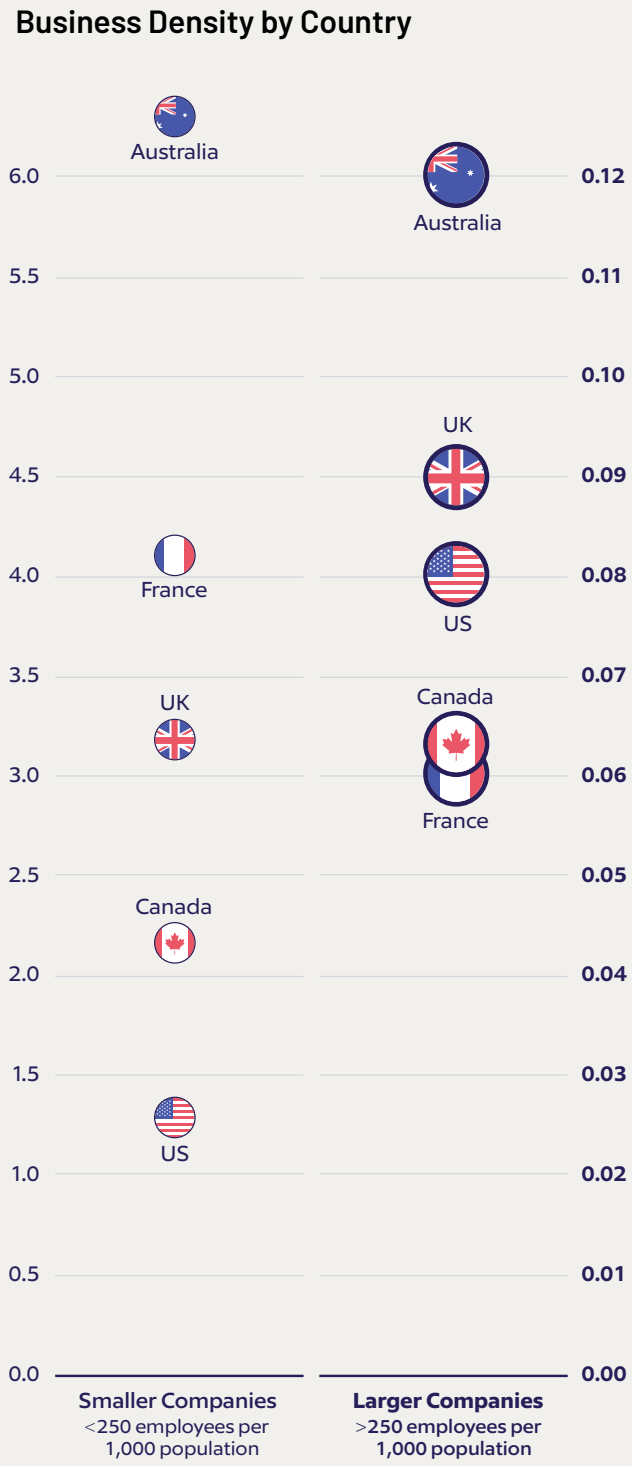


Figure 4: Statistics about business density show that Canada has a low number of businesses per capita when compared to peer countries. Calculations use 2018 OECD population data and 2017 SDBS data. See: "SDBS Structural Business Statistics (ISIC Rev 4): Number of SMEs and large firms," 2021, OECD. Includes stats for businesses corresponding to divisions 05 to 82 (excluding 64-66) of the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4. org/10.25318/3310022201-eng

Canadian companies are more likely to register their IP outside of Canada.[63] If there aren't adequate clients in Canada, a Canadian company trying to scale and attract investment will instead look to the United States, Europe, and elsewhere. Several interviewees said they would only invest in formal IP in markets where they needed to protect themselves from competitors. Since the Canadian market was so small, they were not worried about competition making a similar product. "You have to protect yourself in the biggest market opportunities, and where your competitors are going to come from…," and "you can't really make a case for why it's worth bothering [to protect IP in small markets like Canada]. If you're protected in the U.S. and nobody can go into that market, then they won't bother going into Canada." International IP registration is not, in and of itself, a concern: Canadian businesses accessing international markets and scaling is good for Canada's economy. However, as will be explored through interviewee perspectives in this section, young businesses may also move operations, executive talent, and headquarters to other countries, which in the long run does not improve Canadian business density and maturity. Similarly, growth to Canadian business density and market size might encourage new market-seeking FDI to Canada. Accordingly, IP registration data may be an important indicator of which markets MNEs and Canadian businesses regard as attractive and competitive.

IP registration data confirms that Canadians file IP in other countries more than they do in Canada, and this trend has only increased over time. In 2004, among the 56,374 Canadian patents in force globally, 25% were in force in Canada and 75% were in force abroad. By 2018, among the 142,068 Canadian patents in force globally, just 16% were in force in Canada, and the remaining 84% were in force abroad. Similarly, in 2019, applications filed by Canadians within Canada accounted for just 30% of all Canadian trademark applications and 9% of Canadian industrial design applications.[64]

Trends in IP application data further demonstrate that this trend will continue in the future. From 2000 to 2019 the number of Canadian patent applications filed in Canada rose by just 1.2%, even as the number filed abroad more than doubled.[65] Similarly, from 2000 to 2019, the number of Canadian trademark applications filed in Canada increased by just 30% while the number filed abroad increased by 196%.[66] Finally, while the number of Canadian industrial design applications filed within Canada decreased by 7.5% from 2000 to 2019, the number filed abroad increased nine times over.[67]

63 "Analysis of more than 100 million patent applications from more than 90 patent offices around the world, shows that Canadians primarily patent abroad. Almost three quarters (73 per cent) of Canadian innovations are filed in the United States. Of the innovations that are filed in Canada, 70 per cent are also filed in other countries…the fact that Canadian inventors are patenting abroad, and that this trend is growing, is good news in that it suggests increasing IP sophistication." See: Blit, J., "To foster domestic innovation, Canada needs less intellectual property rights, not more." October 2021, The Hill Times, https://www.hilltimes.com/2021/10/25/to-foster-domestic-innovation-canada-needs-less-intellectual-property-rights-not-more/323411

64 Source: WIPO statistics database.

65 Canadian patent applications in Canada rose from 4187 in 2000 to 4,238 in 2019; while those abroad rose from 9,764 in 2000 to 20,936. Source: WIPO statistics database.

66 Canadian trademark applications in Canada rose from 22,080 in 2000 to 28,608 in 2019; while those abroad rose from 23,028 in 2000 to 68,092 in 2019. Source: WIPO statistics database.

67 Canadian industrial design applications in Canada decreased from 751 in 2000 to 695 in 2019; while those abroad rose from 739 in 2000 to 6,828. Source: WIPO statistics database.

As seen in **Figure 5**, Canadian companies file their IP where they do business: the top international destinations for Canadian IP applications closely resembles the top destinations for Canadian exports and Canadian direct investment. Canadian IP is most often filed in the United States, European Union, and China, which together account for about three-quarters of Canadian IP applications abroad.[68] The U.S., EU, and China are also Canada's largest trading partners,[69] and are within the top six investment locations for Canadian direct investment abroad.[70]

IP Filing Trends Among Canada's Economic Partners

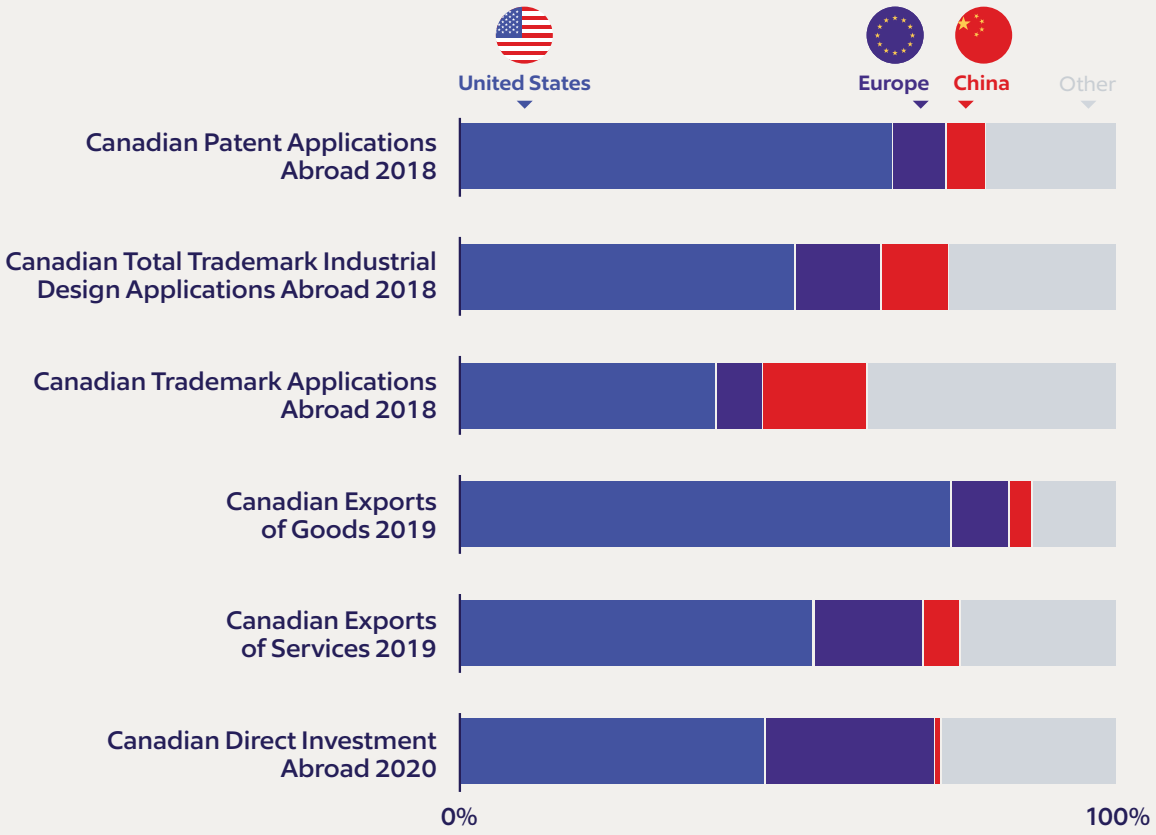


Figure 5: IP filing trends among Canada's economic partners.

Data source: CIPO IP registration data, 2019; Statistics Canada Balance of International Payments data, 2021; Statistics Canada International Investment Position data, 2021.

68 "IP Canada Report 2019," August 29th, 2019, CIPO, https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/h_wr04682.html

69 https://www.international.gc.ca/gac-amc/publications/economist-economiste/state-of-trade-commerce-international-2020.aspx?lang=eng

70 The US accounts for the largest share of CDI abroad; the EU accounts for the second largest share; and China accounts for the 6th largest share. See: Statistics Canada International Investment Position data

IP is not the only thing that Canadian companies may move to international markets. Canadian company sales offices or executive team members may also be moved abroad. Canadian businesses may need to "Americanize themselves to focus on U.S. customers and U.S. partnerships" in order to build out a market to the south. While the benefits from Canadian company growth may remain in Canada (such as corporate taxes), some interviewees suggested that after their first exit, seasoned entrepreneurs are likely to move to the U.S. and stay there for future business ventures. Further, interviewees suggested that entrepreneurial brain drain may have a significant impact on Canadian business maturity, the number of startups and SMEs in Canada and their quality. In circumstances where a business and its executive talent leave Canada, the capital from their successful first exit may not get reinvested in Canada. Similarly, Canada's small market means that companies looking to attract investment need to demonstrate international market access:

> *If you want to be a unicorn, you can't do it [in Canada] unless you get a monopoly because we only have thirty-five million consumers. So, for Canadian companies to be attractive to investors, they have to be in a world market, they have to be Shopify, right? They have to have that perspective, and then the money will go where the money will go. Where the money goes is completely amoral.*
>
> – Advisor to high-growth companies

> *The main thing that's lacking in Canada is a customer base. That's pretty much the reason why things transitioned to Norway. It's hard to justify corporate investments in areas where there's no markets.*
>
> – Clean technology company

Interviewees suggested several opportunities for Canadian companies to gain new market access.

Canadian companies can forge strategic partnerships with foreign investors or international first buyers to help them scale, access broader markets, and gain business experience. Some Canadian companies negotiate successful partnerships with international clients or investors who help them de-risk a technology and access international markets. Interviewees noted that the success of this type of partnership depends in part on the Canadian company going into it with their "eyes open" about IPRs and the potential for acquisition. Interviewees felt that acquisition was not necessarily a bad thing, so long as it happened at the right point in time: later acquisition for more capital, after a product is developed and trialled with customers, was seen as much better than early acquisition for less capital, particularly pre-prototype.

There are also many opportunities for FDI to take place at a threshold that gives a FMNE a significant but not majority share in a company (the minimum threshold for FDI is 10%):

> *We sold a quarter of the [Canadian] company to a German company for U.S. $250,000 and they got distribution rights. This allowed us to finish up development and turn it into a successful venture. Then once the boom for that product passed, we were able to sell it to another company in the United States for a couple million. It's in the realm of startups, not really moving the needle, but for us trying to just find our way in the world and first things to stand on that was a good, modest success.*
>
> – Medical technology CEO, Canada

From the perspective of one international investor, this kind of strategic partnership relies on their feeling of confidence in a startup's market-appropriateness:

> *We basically try to find a solution that would work in the international market and then take that to a broader market by providing the testbed and project financing.*
>
> – Investment Lead, energy and technology sector FMNE

Similarly, one former Canadian company voiced an appreciation for the training it received by merging with an international company:

> *In terms of my personal long-term career, being able to join a company before they go public, all of the transition and finance involved, it's just a once-in-a-lifetime opportunity for personal growth. There's not a lot of people in Canada that have that experience, and now we have 200+ people in [Canadian city] who have that. Probably 25 people out of my staff are now millionaires... so it's really to drive liquidity, not just for myself, but for our entire community.*

Several interviewees commented that Canadian business culture plays a role in keeping the country's business density low. They felt that companies that choose to remain mostly within the Canadian market rather than seek international access, prioritize quality of life and sustainable business over rapid growth and innovation. One interviewee suggested that entrepreneurs who stay in Canada build their companies slowly and then use their exit funding for retirement. They also sell for lower acquisition prices than peers in Silicon Valley (although this trend appears to be changing).

> *What's been helpful is having more founders growing their businesses in Canada and growing within an ecosystem so that, if they exit at $5 million or $10 million, they are investing it back into a Canadian city. Before, it used to be, you take the exit and retire into the sunset.*
>
> – Connector organization, U.S. and Canada

Other interviewees observed a passivity in Canadian business culture, describing situations where Canadian companies had turned down work outside their domain where a similar American company accepted the contract. An investor described Canadian innovation as slower-paced, with companies more likely to prioritize work-life balance and less likely to work in an agile and collaborative manner with clients.

> *Canadian startups definitely have very good ideas, and technology, and a tremendous amount of support from government, but when it comes to application there is a little bit of lag. They don't really think about it from the customer's perspective.*
>
> – Investment Lead, energy sector and technology FMNE

Another respondent commented that **Canadian companies that did not move abroad were highly acquisition driven because the small domestic market made it challenging to scale.** Regarding IP commercialization, many Canadians may be building to sell rather than building to reinvest. Previous studies, such as by the Institute for Research on Public Policy[71] and the Canadian Council of Academies,[72] suggest that Canadian inventors and entrepreneurs have a strong propensity to transfer or sell their IP and/or businesses to foreign companies rather than commercialize and scale their inventions themselves. This problem is exacerbated in subsectors like healthcare where major public procurers are risk averse, making it hard for startups to prototype, adjust, and scale.

> *The [Government of Canada] can continually put money into startup companies, but there is no incentive for Canada to adopt its own [healthcare] technologies, and that's been a big barrier.*
>
> – Tech & Innovation lead, health sector MNE

The theme of acquisition and exit planning is discussed in greater detail later in this paper, as it relates not only to market size but also to capital availability.

71 Nancy Gallini and Aidan Hollis, "To sell or scale up," August 2019, IRPP, https://irpp.org/wp-content/uploads/2019/08/To-Sell-Or-Scale-Up-Canadas-Patent-Strategy-in-a-Knowledge-Economy.pdf

72 "Competing in a Global Innovation Economy: The Current State of R&D in Canada," 2018, Expert Panel on the State of Science and Technology and Industrial Research and Development in Canada, Council of Canadian Academies, https://cca-reports.ca/reports/competing-in-a-global-innovation-economy/

Local business density is key to ensuring FDI has positive spillover effects. When there is a high density of people and firms and strong network connections between local and global players, the host economy becomes better able to integrate into global value chains and absorb FDI's positive spillover effects.[73] **Foreign investors have an opportunity to improve business density in their Canadian communities by offering ecosystem development programs and incentives.** One greenfield investor in Canada said that their organization offered educational programming and accelerators to foster new talent in their subsector from grade school forward, and this included support for startups and researchers. Another investor ran collaborations with small companies that helped them implement and integrate new software in a real-world enterprise environment. Both of these organizations sometimes left IP in the hands of the researchers or companies (in cases where most of the development was done by the Canadian researcher or startup), and sometimes viewed the process more as co-creation where IP needed to be negotiated by the head office or subsidiary. While some FNMEs already demonstrate strong corporate citizenship, a more level playing field for IP and business knowledge (discussed in a subsequent section) would help more Canadian businesses negotiate mutually beneficial contracts.

> *If you only complain about the shortage of talent and do not invest in the ecosystem, you should not have the right to complain. It's like voting. You shouldn't complain if you don't vote.*
>
> – Vice President, media FMNE

Talent

> *[Funding] incentives should absolutely be a consideration for where you're going to locate that office and hire people. But it's always talent first. If there's no talent there, why bother?*
>
> – Head of Procurement, software FMNE

Talent is a major lever in FDI attraction[74] and strong talent also supports domestic innovation. Talent was a key focus of the Government of Canada's Building a Nation of Innovators report.[75] Talent in Canada's technology sector is highly related to market size, the critical mass of industries, and the maturity and experience of the entrepreneurs within it. Interestingly, many investors highlighted Canada's talent pool as an important reason for why they had come to Canada, but this primarily referred to technical talent rather than entrepreneurial talent. Domestic and international interviewees alike noted that seasoned talent with business experience was harder to find in Canada, a finding that is noted in past studies of Canada's innovation ecosystem.[76]

73 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, *OECD*, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

74 That said, the expansion of remote work is likely to impact these trends: while propensity for remote work varies by sector, increasingly, employers may be located in different countries or regions than their employees.

75 "Building a Nation of Innovators," 2019, Government of Canada, https://www.ic.gc.ca/eic/site/062.nsf/vwapj/New_ISEDC_19-044_INNOVATION-SKILLS_E_web.pdf/$file/New_ISEDC_19-044_INNOVATION-SKILLS_E_web.pdf

76 "A major driver of [entrepreneurs selling their firms to foreign investors rather than develop them to scale domestically] is the **lack of managerial experience and IP skills in Canada** required to guide technology firms as they go through periods of rapid expansion into global markets." See: "Competing in a Global Innovation Economy: The Current State of R&D in Canada," 2018, Expert Panel on the State of Science and Technology and Industrial Research and Development in Canada, Council of Canadian Academies, https://cca-reports.ca/reports/competing-in-a-global-innovation-economy/

According to interviewees, more FDI in the Canadian business and tech ecosystem has many effects on talent: it provides an important training ground for Canadian talent; it creates tougher labour market competition for Canadian companies; and it may attract more international talent to Canadian cities. These sentiments were reflected in research by Startup Genome and the Global Entrepreneurship Network, which, in 2020, ranked the top 30 global startup ecosystems according to six success factors: performance, funding, connectedness, market reach, knowledge, and talent.[77] According to the report, Canadian startup ecosystem Toronto-Waterloo ranks well for the cost and availability of STEM[78] and life sciences talent but poorly for the availability of "scaling experience." Montreal and Vancouver meanwhile have low rankings for the availability of "startup experience" in their ecosystems. That said, the 2021 update to the Global Startup Ecosystem Report shows some improvement in the later two categories: for all three cities, the rating for either startup experience or scaling experience improved.

In Canada, highly educated technology personnel cost less than they do in the U.S.: this is a key aspect of FDI attraction. Foreign investor interviewees mentioned that the high quality of post-secondary education, the proportion of Canadians with post-secondary education, and lower Canadian salaries (coupled with exchange rates) were essential to their decision to invest here. Reinforcing this finding, one study found that for bilateral U.S. and Canada FDI, depreciation in the host country's currency has a positive impact on FDI quantities.[79]

This study interviewed foreign greenfield investors and companies that entered Canada through acquisition. Both noted that they stayed for talent, salary, culture, and quality of life.

> *"You want to open up offices where there is access to talent. Also, where do people want to live? You've got great schools with UBC or BCIT, and you often see that once you live in Vancouver, it's very difficult to leave, even though it's quite remote. That's why that office is still there after we acquired the company. It has access to talent, and we're not going anywhere."*
>
> – Head of Procurement, software FMNE

However, talent availability varies by city: Toronto and Vancouver have become competitive, with skilled talent a little harder to find at an affordable price compared with cities like Winnipeg (mentioned by one interviewee as a destination for entertainment technology talent). In a recent survey of Canadian businesses by KMPG, "the inability to find talent was identified as the number one threat to growth prospects."[80]

77 "The Global Startup Ecosystem Report 2020," June 25, 2020, Startup Genome, https://startupgenome.com/reports/gser2020

78 STEM refers to the science, technology, engineering, and mathematics fields.

79 Rao V. Nagubadi and Daowei Zhang, "Bilateral Foreign Direct Investment in Forest Industry between the U.S. and Canada," Forest Policy and Economics 13, no. 5 (June 1, 2011): 338–44, https://doi.org/10.1016/j.forpol.2011.03.002.

80 "Nearly 70 per cent of Canadian businesses struggling to find skilled talent," August 2021, CISION; KMPG, https://www.newswire.ca/news-releases/nearly-70-per-cent-of-canadian-businesses-struggling-to-find-skilled-talent-893065566.html

Half of the businesses in the survey indicated that they would consider recruiting talent from outside of Canada in the coming years. Fortunately, bringing skilled talent to Canada is relatively easy compared to other countries. This is due to Canada's high immigration targets,[81] its attractiveness to highly skilled immigrants as a destination[82] and the presence of streamlined immigration programs like the Global Skills Strategy.[83] From 2017 to 2021, the Global Skills Strategy fielded 64,178 work permit applications with a 94% approval rate.[84]

Foreign investors and MNEs talked about the type of talent they keep in Canada (rather than outsourcing): this included engineers, software developers, AI specialists, creatives, financing, legal, accounting, and procurement officers. Other types of talent might need to be sourced abroad: for example, one interviewee noted that they went to San Francisco for specialized roboticists, while others looked to the U.S. for executive talent.

Management teams and founding teams are identified by U.S.-based VCs as a key factor in investment decisions and startup success.[85] Many interviewees see a dearth of seasoned business talent in Canada. To scale a business successfully, entrepreneurs may need experience with:

- Regulatory navigation (particularly in areas like fintech, digital health)
- Funding models (managing good and bad debt, reimbursement, conditions of funding)
- Derisking a product (moving from an idea to a prototype to market readiness)
- Implementation (when a product is market ready, working with clients on operational needs)
- Intellectual property management (creating and IP strategy, knowing whether, when, where, and how to file IP, secure freedom to operate; not commercializing IP too early; negotiating licensing agreements)

Foreign companies in Canada act as an important training ground for Canadian tech talent, but wage pricing can also cause problems for Canadian startups trying to compete. One interviewee from Vancouver commented that big greenfield investors had helped raise the quality of tech talent in their community:

81 "Notice – Supplementary Information for the 2021-2023 Immigration Levels Plan," June 2021, *Government of Canada*, https://www.canada.ca/en/immigration-refugees-citizenship/news/notices/supplementary-immigration-levels-2021-2023.html

82 A 2021 survey of 208,807 workforce respondents in 190 countries ranked Canada as the number one migrant destination and the number three remote work destination in the world. See: Kovács-Ondrejkovic, O. et al., "Decoding Global Talent: Onsite and virtual," March 2021, *Boston Consulting Group*, https://web-assets.bcg.com/cf/76/00bdede345b09397d1269119e6f1/bcg-decoding-global-talent-onsite-and-virtual-mar-2021-rr.pdf

83 "Global Skills Strategy: About the process," September 2019, *Government of Canada*, https://www.canada.ca/en/immigration-refugees-citizenship/services/work-canada/hire-temporary-foreign/global-skills-strategy.html

84 Global Skills Strategy," Dec 2021, Invest in Canada, https://www.investcanada.ca/programs-incentives/global-skills-strategy

85 Paul Gompers et al., "How do Venture Capitalists Make Decisions?," September 2016, *National Bureau of Economic Research,* https://www.hbs.edu/faculty/Pages/item.aspx?num=51659

> *We [Vancouver] had, somewhat still has, this major issue where the best of the best, once they get to the top of their craft, get sucked into the Valley [Silicon] or somewhere else. So, we had this void of senior talent, but a lot of scrappy talent, good entrepreneurs with nobody to learn from, nobody doing lunch and learns or meetups. And now we do that. We get together in the community, we have smart data science people in front of 100 people in a room, we see mentorship. And if we did not have the Disneys and the Microsofts, Sonys, EAs [Electronic Arts], and Amazons in town, we would not have the quality of senior talent that you absolutely have to have at the centre of any tech community, those massively respected individuals who can share knowledge and raise talent quality across the board.*
>
> – COO, formerly of several media FMNEs

The same interviewee noted the downside of this: smaller startups were often unable to hire talent because of the high wages these large companies are willing to pay. They advocated for a balance where industry associations and formal and informal networks maintain proactive communication between small companies and large foreign investors. They felt that most businesses in an ecosystem could be convinced to reinvest in their community by avoiding egregious wage differences, but that having strong lines of communication and industry associations was an essential prerequisite (and that even then, there would always be particular companies who paid more). Another interviewee in Toronto had also encountered wage issues, but felt that it came with pros and cons:

> *If Google weren't in Toronto, it's possible that talent would be a little bit cheaper, but also not as specialized or not as good at their jobs.*
>
> – CEO, Canadian AI sector

Salary data can help clarify the impact that greenfield investment has on salaries in Canada. ICTC analyzed 4,677 job postings[86] for Software Engineers, Developers, and Designers[87] in the Vancouver census metropolitan area (CMA). Among the 250 job postings that contained salary data, no significant difference is observed between the median base salaries posted by multinational enterprises (MNEs) and those posted by Canadian companies: both register at around $70,000 per year.[88] However, not all MNEs are equal: among jobs posted by the "big five" tech companies,[89] the median advertised base salary jumps 63% to approximately $114,220 per year.

86 Job postings were posted from June 2020 to July 2021 on select websites

87 NOC 2173 (Software Engineers and Designers)

88 The average base salary for job postings by MNEs (which accounted for 45% of the observed salaries), was $71,040 per year. Similarly, the average base salary for job postings by Canadian companies (which accounted for 55% of the observed salaries) was $70,160 per year.

89 The big five tech companies are Google, Amazon, Facebook (now Meta), Apple, and Microsoft. These account for 807 of the job postings and 21 of the reported salaries.

While the jobs postings data applies only to the Vancouver CMA and is based on a limited number of salary observations, the findings are replicated in other salary data (see **Figure 6**). According to Glassdoor[90] and LinkedIn,[91] the average base salary for Software Developers and Engineers in Canada is around $80,000, whereas Google, Amazon, Facebook(now Meta), Apple, and Microsoft pay on average between $90,000 and $120,000. These five companies also hire a significant number of Software Developers and Engineers in Canada each year, meaning they have a considerable impact on salaries for these roles. This finding comes with pros and cons. On the one hand, these companies create high-paying jobs for Canadian workers; drive up salaries for certain roles through competition for labour; and, as discussed below, possibly improve the availability of skilled talent over time. On the other hand, they create more competition for Canadian talent in an already tight labour market. This puts additional downward pressure on Canadian startups and SMEs, which may find it difficult to compete with FMNEs for Canada's top talent.

Average Base Salary for Software Engineers in Canada

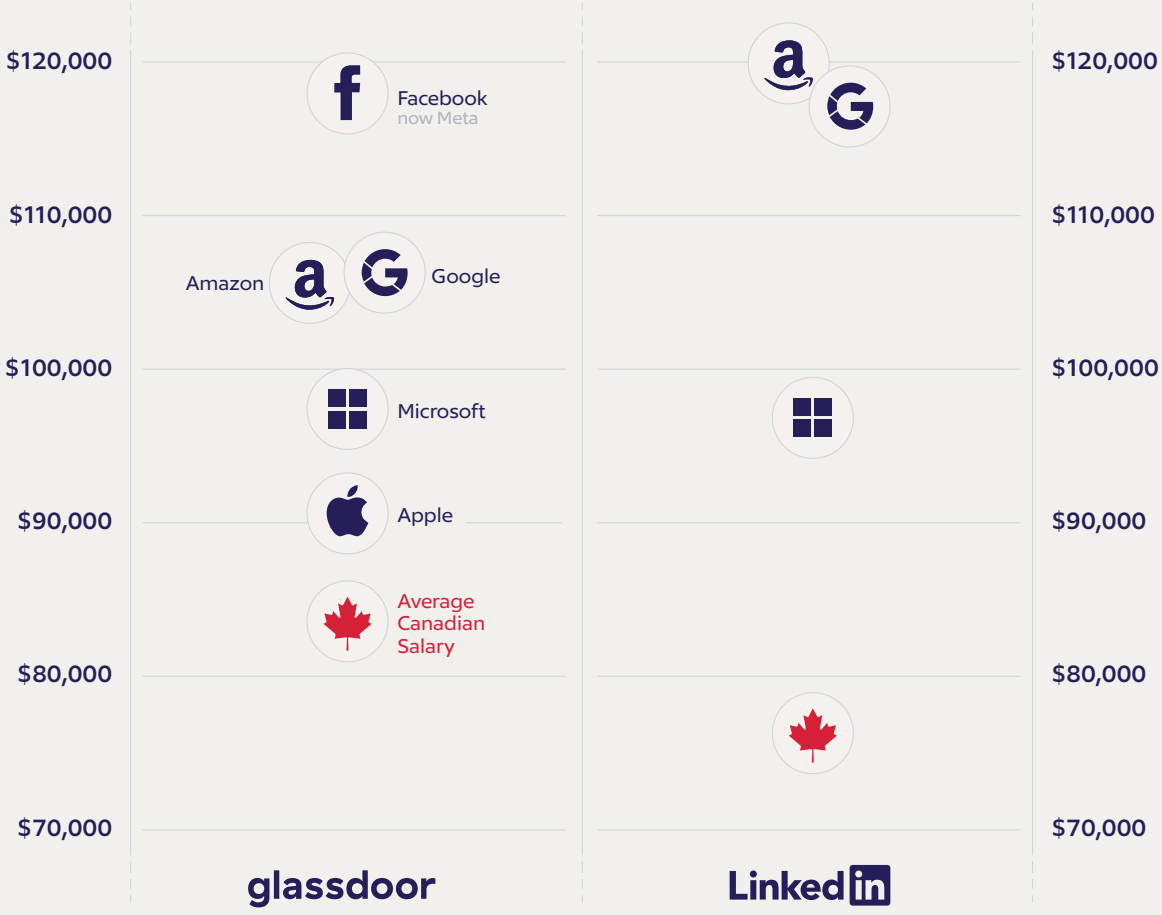


Figure 6: Average base salary for software engineers in Canada and software engineers at select companies.
Data source: Glassdoor Salaries and LinkedIn Salary. Accessed July 2021.

90 According to Glassdoor, the average base salary for Software Developers in Canada is $83,235. Accessed July 2021. See: "Salaries," 2021, *Glassdoor*, https://www.glassdoor.ca/Salaries/index.htm

91 According to LinkedIn, the average base salary for Software Developers in Canada is $76,000. Accessed July 2021. See: "Salary," 2021, *LinkedIn*, https://ca.linkedin.com/salary/

Big-name FDI may draw more talent to a city, reversing the brain drain and attracting international talent to Canada. FDI proponents noted that even though larger headquarters might create intense competition for Canadian startups in the short term, in the long term, corporate headquarters and big-name presences would draw global talent and spill over into a more mature and experienced tech sector. While it is difficult to measure the movement of technical talent between innovation ecosystems, one possible way of measuring "brain drain" or "brain gain" is employed by CBRE in its 2020 report on tech talent. CBRE compares the number of tech graduates within an innovation ecosystem to the number of tech jobs added and uses the difference to determine if local talent was enough to fill demand.[92] According to CBRE, between 2015 and 2019, Toronto and Vancouver attracted the second and third most technical workers to their innovation ecosystems, behind only the San Francisco Bay Area. Calgary and Montreal placed 13 and 15 on CBRE's list. CBRE's research is, however, unable to determine whether technical talent was sourced from foreign countries, nor *why* the ecosystem was able to attract new talent.

High quality jobs are one output of IP commercialization and one of the key benefits of inward FDI. In addition to corporate tax benefits, interviewees noted that jobs were one of the most important reasons to attract and retain FDI and an important way in which IP is commercialized (though respondents advocating for greater domestic IP retention contend that jobs should not supersede IP revenue and are an inadequate trade-off—a debate that is explored later in this paper). One useful way to measure the impact of FDI and MNEs on local job creation is job postings data. The 4,677 job postings[93] that ICTC analyzed show that among Software Engineers, Developers, and Designers in the Vancouver CMA, MNEs are a significant source of new tech jobs. FMNEs accounted for 64% of the total postings and tended to post more job postings per company, per year than Canadian companies. As with the salary data discussed earlier, these statistics represent just one occupation category in one of Canada's innovation ecosystems: trends may vary by occupation, industry, and location.

In FDI attraction and domestic innovation, talent, and IP overlap: "talent" can mean researchers with important subject matter knowledge, or staff with institutional knowledge. In some interviewees' eyes, staff were "IP" that could walk away and start their own businesses or take a better offer (that said, the ability for staff to apply that knowledge at another company, let alone switch companies, may be restricted by nondisclosure agreements [NDAs] and/or non-competes[94]). Some interviewees considered the brain drain to include local talent working for international companies if the IP they create is commercialized abroad (i.e., with the majority of corporate tax benefits going to a head office in another country). Others felt that keeping a job in Canada, international or not, is more of a success than allowing that job to go elsewhere.

92 "2020 Scoring Tech Talent," July 2020, *CBRE*, https://www.cbre.ca/en/research-and-reports/Scoring-Tech-Talent-in-North-America-2020

93 Job postings were posted from June 2020 to July 2021 on select websites

94 Some provinces, such as the province of Ontario are considering banning non-compete agreements. According to the Government of Ontario, non-compete agreements can restrict work opportunities and suppress wage growth. University of Ottawa's Matt Malone writes that non-compete agreements prevent knowledge spillovers, "a critical factor in building vibrant and prosperous economies." Nonetheless, others have expressed concern over companies' ability to protect trade secrets and other valuable IP. See: "Ontario Creating a Better Future for Workers," October 2021, Government of Ontario, https://news.ontario.ca/en/release/1001033/ontario-creating-a-better-future-for-workers; Malone, M., 'Matt Malone – Non-Competes Are Holding Canada Back – So Let's Ban Them," September 2021, C.D. *Howe Institute*, https://www.cdhowe.org/intelligence-memos/matt-malone-%E2%80%93-non-competes-are-holding-canada-back-%E2%80%93-so-let%E2%80%99s-ban-them; Courage, N., "Use of Employee Non-compete Agreements About to Become Void in Ontario," October 2021, Lexology, https://www.lexology.com/library/detail.aspx?g=4d347043-fdf0-44b1-9836-ff4b7e146aea

Knowledge spillovers and new firm entry: do foreign firms act as training grounds for future Canadian entrepreneurs?

Economists have long posited that FMNEs bring important skills and know-how to local economies as a result of their international success and expertise. The empirical literature finds that this varies by type of FDI and type of host/home country.

Knowledge and technology transfers can be vertical (via procurement or services to customers) or horizontal (via training in the same industry). One study found that more developed countries are more likely to benefit from knowledge spillover from FMNE procurement because investors are more likely to use local inputs in locations that can comply with quality standards.[95] FMNEs source most of their inputs from local suppliers, and in the tech sector, this could refer to a FMNE procuring hardware or contracting out development.[96] That said, distance between countries or high tariffs and import costs may contribute to knowledge spillover from FMNE procurement (i.e., a FMNE is more likely to procure goods or services locally if they are too expensive to obtain from their home country).[97]

Another, theoretical argument for backward vertical spillovers is that local producers selling to larger firms are then linked to a larger market with beneficial economies of scale.[98] Echoing this, several interviewees described situations where a FMNE was able to distribute its offering internationally through procurement or partnership. Again, whether host countries benefit from spillovers depends on how absorptive the local innovation ecosystem is, making business density, strong network connections, and mutually beneficial partnerships important.[99]

A second question is whether FMNEs result in the creation of new companies (for example, does an employee of a FMNE's corporate headquarters then leave to start their own Canadian company with improved training and experience?). Here, evidence is mixed. Some studies find that FDI has "crowding effects" that make it hard for new firms to compete, similar to what has been discussed in this study with regard to salary competition.[100] Conversely, one study examining knowledge-based entrepreneurship in Ireland compared with Wales sees higher rates in Ireland, possibly related to FDI (Acs et al. 2007). Another study compares Malaysia, Singapore, Hong Kong, and Thailand, and observes heterogeneity across these countries despite their similarities.[101]

95 Tomas Havranek and Zuzana Irsova, "Estimating Vertical Spillovers from FDI: Why Results Vary and What the True Effect Is," Journal of International Economics 85, no. 2 (November 1, 2011): 234–44, https://doi.org/10.1016/j.jinteco.2011.07.004

96 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

97 Beata S. Javorcik and Mariana Spatareanu, "Does It Matter Where You Come from? Vertical Spillovers from Foreign Direct Investment and the Origin of Investors," Journal of Development Economics 96, no. 1 (September 1, 2011): 126–38, https://doi.org/10.1016/j.jdeveco.2010.05.008.

98 Laura Dawson, "Potash and BlackBerries: Should Canada Treat All Foreign Direct Investment the Same?" *Macdonald-Laurier Institute*, June 2012, https://www.macdonaldlaurier.ca/files/pdf/Should-Canada-Treat-All-FDI-The-Same-Commentary-June-2012.pdf

99 Cadestin, C. et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

100 Saurav Pathak, Emanuel Xavier-Oliveira, and André O. Laplume, "Influence of Intellectual Property, Foreign Investment, and Technological Adoption on Technology Entrepreneurship," Journal of Business Research, Strategic Thinking in Marketing, 66, no. 10 (October 1, 2013): 2090–2101, https://doi.org/10.1016/j.jbusres.2013.02.035.

101 Ibid.

One review article suggests that FDI can simply alter the form of new firm entry by improving domestic entrepreneurs' management practices and process efficiencies, particularly if the domestic ecosystem is absorptive enough to benefit from defecting employees of FMNEs (by offering them adequate new opportunities so they do not move to a new location). Similarly, entrepreneurs may choose to pursue vertical entrepreneurship to avoid direct competition and take advantage of procurement relationships.[102] This paper suggests that a developed economy with appropriate critical mass—the ability to absorb former employees of FMNEs with adequate business density and pay competitive salaries—stands to benefit from FDI. In industries without critical mass, entrepreneurs may find more success founding companies that take advantage of FMNEs distribution networks via procurement until they are able to directly compete.

102 Ibid.

CASE STUDY

Senior Talent Flows in the Medical Device Industry

One interesting way to measure the impact of FDI on local talent is by asking the question: where does local, startup talent go when a company is acquired by an MNE? Similarly, what is the professional background of local founders? These questions were first asked by Scott Phillips, CEO of StarFish Medical, while conducting informal research on the medical device industry:

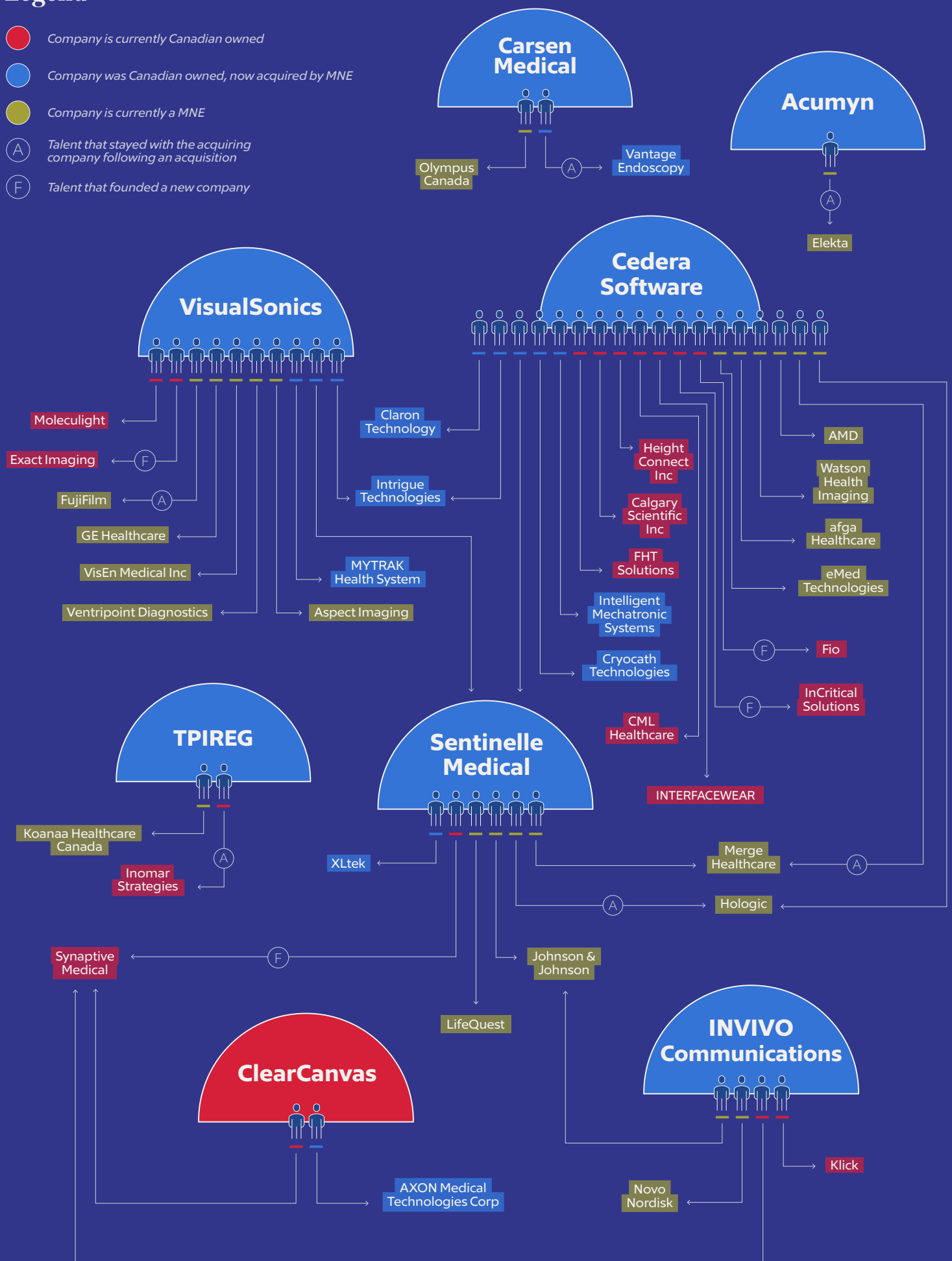
> *Employees are learning by doing the hard part–once you launch, you have to commercialize and get to scale. This will train a whole new generation, and there will be a bunch of spin-offs... Sentinelle had a great exit to Hologic. Now Cameron Piron is leading a much more ambitious story in Synaptive and has the credibility to attract capital.*
>
> – Scott Phillips, CEO, StartFish Medical[103]

103 Scott Phillips, "Current state of innovation in the Canadian medical device industry," July 8, 2017, *StarFish Medical*, https://starfishmedical.com/blog/current-state-of-innovation-in-the-canadian-medical-device-industry/

Figure 7, below, demonstrates where local, senior talent went when 16 Canadian medical device companies in the GTA were acquired by MNEs. The network diagram shows that local talent in the medical device industry is dynamic and that the paths taken by senior talent following an acquisition are diverse. In six of the companies, senior talent mostly moved to other local startups, whereas in five of the companies, senior talent only moved to other MNEs. Further, while talent at nine of the companies is isolated, talent belonging to seven of the companies (located in the centre and bottom right of the diagram) appear to be closely interconnected. These findings suggest that Toronto's medical device ecosystem has the critical mass needed to absorb human and intangible capital following an M&A. A smaller Canadian city with lower business density might not have the same outcome.

Notably, senior talent from seven of the acquired companies decided to become company founders themselves, and in total 14 new companies were spawned. In cases where senior talent founded a company, it was common for them to hire several of their former team members and colleagues. On this topic, one interviewee noted that in addition to companies, it is important to study the role of individuals in innovation ecosystems. Specifically, they highlighted that it is ultimately individuals who innovate, and the relationships that they establish can cross company lines and even survive bankruptcies and acquisitions.

> *"If you're just looking at organizations, you're probably missing some of the richness. Informal relationships in physical spaces are really important: people going to barbecues together even if they work for competitors... It's hard to get at the social and informal relationships. You can try to proxy for them, but we have a tendency to forget that it's individuals working with individuals who are collaborating."*
>
> – Professor, subject matter expert


Legend
Company is currently Canadian owned
Company was Canadian owned, now acquired by MNE
Company is currently a MNE
A Talent that stayed with the acquiring company following an acquisition
F Talent that founded a new company
Carsen Medical
Olympus Canada
A
Vantage Endoscopy
Acumyn
A
Elekta
VisualSonics
Moleculight
Exact Imaging
F
FujiFilm
A
GE Healthcare
VisEn Medical Inc
Ventripoint Diagnostics
MYTRAK Health System
Aspect Imaging
Cedera Software
Claron Technology
Intrigue Technologies
Height Connect Inc
Calgary Scientific Inc
FHT Solutions
Intelligent Mechatronic Systems
Cryocath Technologies
CML Healthcare
AMD
Watson Health Imaging
afga Healthcare
eMed Technologies
F
Fio
F
InCritical Solutions
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TPIREG
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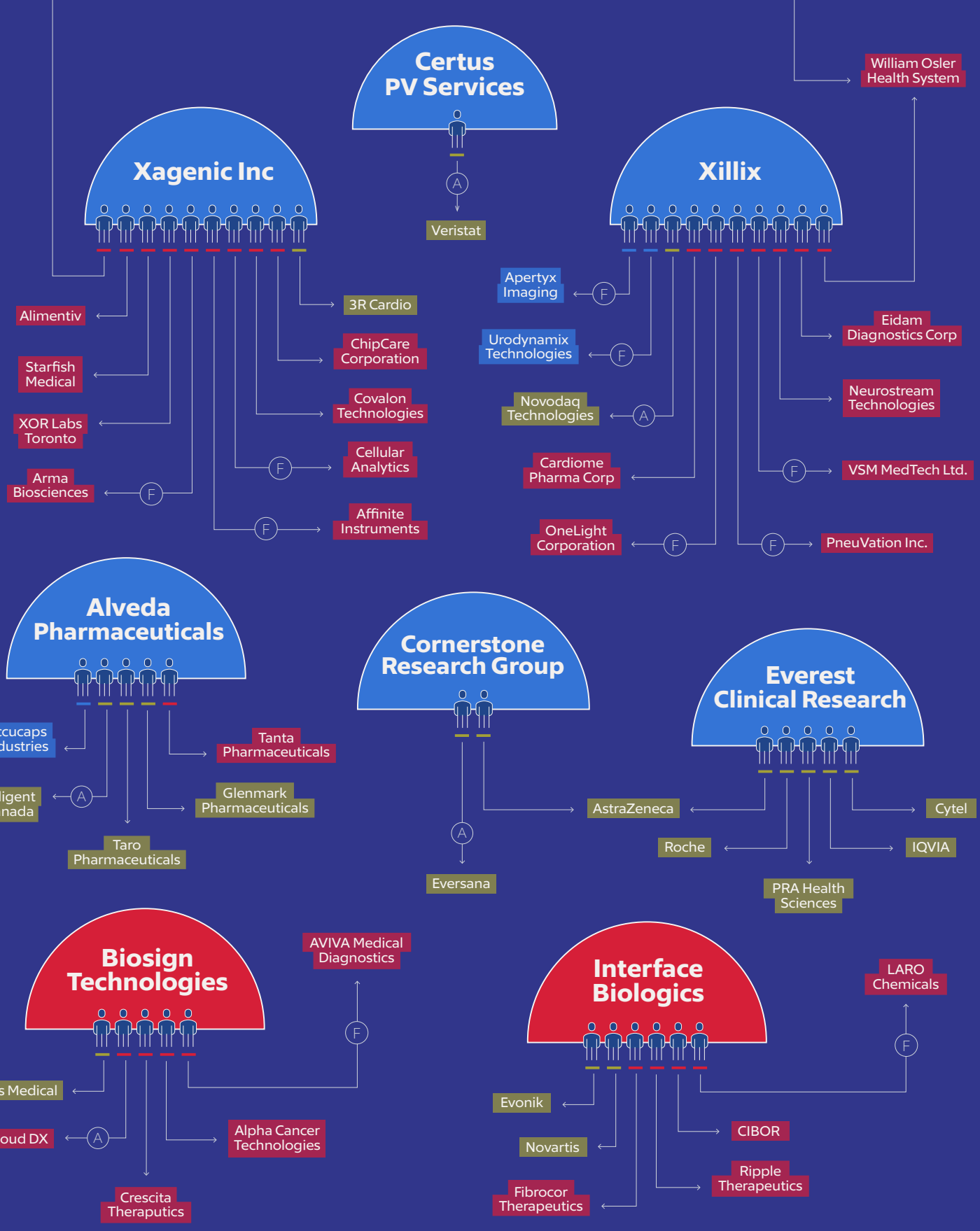

Figure 7: This network diagram shows where senior talent went when 16 Canadian medical device companies were acquired. The blue companies are the acquired companies. The arrows represent talent flows. The "F" indicates where talent founded a new company. The "A" indicates that talent moved to the acquiring company following the acquisition. Web scraping was used to track the movement of employees post acquisition (see Methodology section for more detail).

Figure 8 shows the professional backgrounds of 272 medical device company founders. Of the 272 founders, 94 had worked for a FMNE prior to founding their company, while 151 had worked for a Canadian company. Of these, 73 had worked for both a FMNE and a Canadian company. Most (86%) founders that had no private sector experience came from academic and/or healthcare backgrounds. At a high level, the data shows that the professional backgrounds of founders in Toronto's medical device industry are diverse. Moreover, the data shows that in addition to Canadian companies, greenfield investors act as a valuable training ground for local talent.

Professional Backgrounds of Medical Device Company Founders

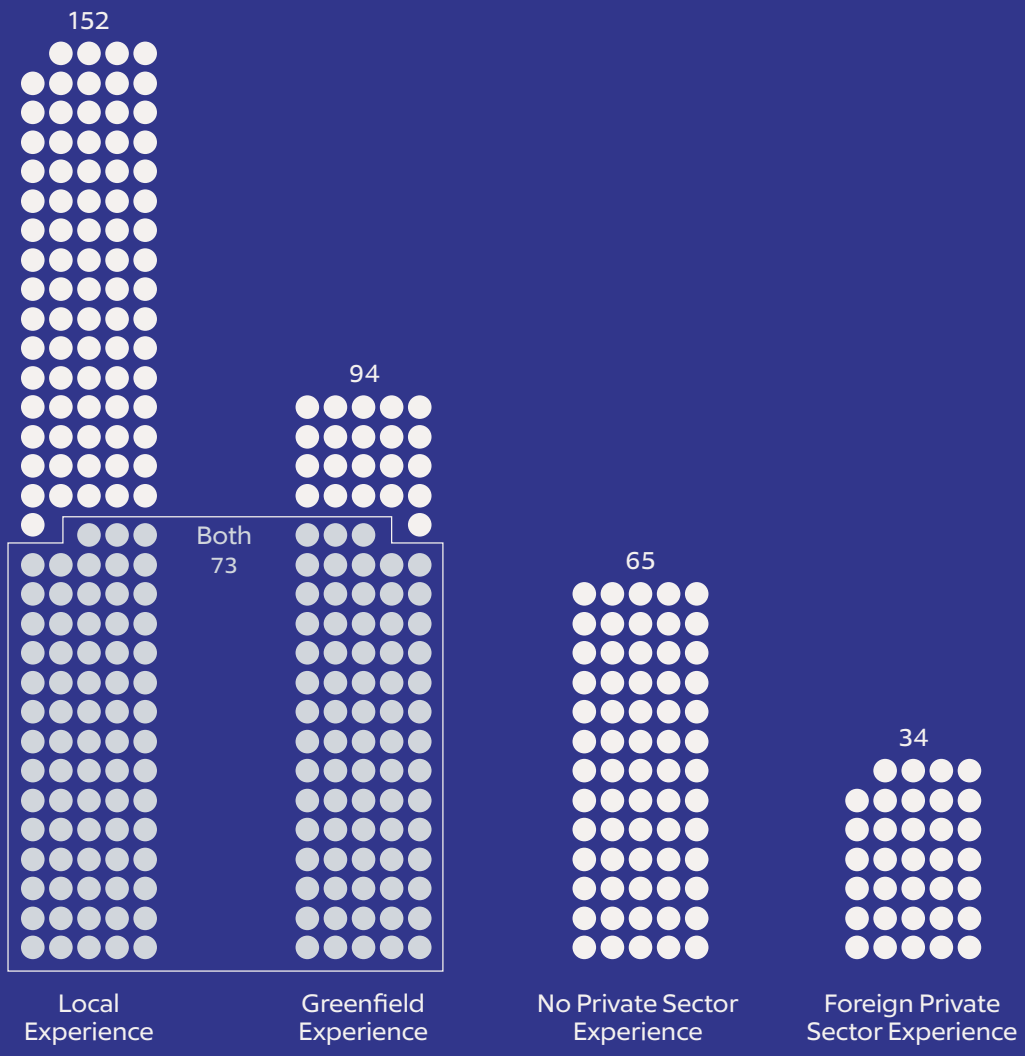

Figure 8: The Professional Backgrounds of Medical Device Company Founders. Web scraping was used to collect data about the professional backgrounds of medical device company founders (see Methodology section for more detail).

COVID-19 and remote working models may change the talent landscape significantly, both for Canadian innovators and foreign investors. Some interviewees differed on whether remote work would become a permanent feature of the technology sector. Nevertheless, many foresaw a world wherein foreign investors and domestic technology companies with R&D shops in Canada might not need to hire Canadian labour.[104] Interest in international remote work is outpacing interest in physically working abroad; among workers, Canada is third most popular destination for international remote employment.[105] Similarly, however, remote work presents the opportunity for Canadian skilled talent to work for international companies but continue to live at home. Furthermore, it means that some Canadian companies looking for specialized talent might not need to move their operations to the U.S. or elsewhere if they can source their staff remotely. Nonetheless, the long-term impact of COVID-19 on the international technology labour market remains to be seen.

> *[Remote work] gives me an advantage to be able to hire any Canadian, if I'm just hiring Canadians. I can say, all right, there are three great people in Fort McMurray and I'm not paying them Toronto or Vancouver salaries.*
>
> – CEO, Canadian AI sector

104 Some government funding programs currently overcome this challenge by requiring eligible companies to have a certain percentage of their employees located in Canada. For example, companies are only eligible for funding from the Innovative Solutions Canada program if "50% or more of [their] annual wages, salaries, and fees are paid to employees and contractors who spend the majority of their time working in Canada," "50% or more of [their] FTE employees have Canada as their ordinary place of work," and "50% or more of its senior executives (Vice President and above) have Canada as their principal residence." See: "Program Eligibility and Process," July 2018, Government of Canada, https://www.ic.gc.ca/eic/site/101.nsf/eng/00002.html#eligibility

105 Orsolya Kovács-Ondrejkovic et al., "Decoding Global Talent: Onsite and virtual," March 2021, *Boston Consulting Group*, https://web-assets.bcg.com/cf/76/00bdede345b09397d1269119e6f1/bcg-decoding-global-talent-onsite-and-virtual-mar-2021-rr.pdf

Attraction in Canada: What do we offer other than talent?

Foreign direct investors and interviewees working in investment attraction listed a number of key factors that draw MNEs to set up shop in Canada. Talent was often the first reason listed, as explored in detail in the previous section. Other than talent, interviewees commented on:

- Cultural and linguistic similarity (e.g., a French company chose Montreal for its access point to North America; English-speaking European companies may select Canada as more culturally proximate than the United States)
- Favourable Canadian currency exchange rate (CAD vs. USD or Euro)
- Political stability
- Relative financial stability following the 2007-2008 financial crisis
- R&D subsidies and infrastructure (explored in depth in a subsequent section)
- Manufacturing and electricity costs in some provinces
- Costs associated with labour (e.g., health care, cost of living, employment subsidies and tax breaks)
- In strategic acquisitions, particular technology or IP, scientific rigour and quality, a unique design and development team, and cultural fit (business culture) with the acquirer
- In strategic acquisitions, market share if a company dominates in a dense population centre
- Physical proximity to the United States, access to exports through USMCA
- Quality of life and lifestyle, both as a draw for international companies choosing where to set up and as a draw for future high quality employees

> *"People who might be attracted to the Valley [Silicon] for the dollars in the past, say, 'All the big companies are here, and I don't have to leave Vancouver. This is the best city in the world, why would I go. I can lure talent from Europe or New York who don't want to move to California."*
>
> – COO, formerly of several media MNEs

Private Investment, Exit Planning, and Acquisitions

As a new company looks for startup or scale-up capital, it has several options, including government funding, personal investment, venture capital, incubators, institutional investors, or business development funding from a bank or private partner. Some companies are purely service companies that grow primarily through contracts and clients. Interviewees noted that their ability to find equity investors, clients, and other capital to grow influenced important decisions about IP management and exit planning. For some companies, IP helped them attract their first round of funding.

In addition, the country from which a company seeks funding may impact its business plans. Some Canadian companies start out looking only for Canadian investment, some because of their existing networks, others because of a lack of experience working in other countries, and still others because of their preference to remain a Canadian Controlled Private Corporation (CCPC). The U.S. has much more access to capital,[106] but interviewees felt that the earlier a company found major U.S. funding, the more likely it and its management was to leave Canada. Conversely, some interviewees found that Canadian VCs put more pressure on companies to exit early. This section addresses challenges that Canadians may encounter when seeking startup and scale-up capital in Canada and internationally, and the impact this has on exit planning.

While seeking international investment might result in a company leaving Canada, it also gives that company access to more experienced partners and bigger markets. Interviewees speaking from a Canadian policy perspective wanted Canadian startups to stay and scale in Canada. Interviewees speaking from the perspective of companies or investors noted that Canadian startups that only talk to Canadian VCs "are often at a huge disadvantage because they don't get the signals of where their product or company benchmarks against the rest of the globe in their market. They don't get that input from [Silicon Valley] investors." Another interviewee felt that Canadian VCs "have a hard time understanding markets outside of Canada and the ability of an investment opportunity to scale outside our borders."

106 Although Canada has a growing venture capital industry, it is much smaller than the U.S., when considered on a pro rata basis. For 2019 venture capital investment, Pitchbook reported $136.5-billion in the U.S., while the Canadian Venture Capital & Private Equity Association reported $6.2-billion, approximately one-half of the 10 per cent measure typically used for comparison to the U.S. market, prior to including foreign exchange. Jennifer Bartman, "Canada's innovation strategy would benefit from an emphasis on the building businesses," October 2021, *The Hill Times*, https://www.hilltimes.com/2021/10/25/canadas-innovation-strategy-would-benefit-from-an-emphasis-on-the-building-businesses/323401

One prominent international investor saw a big gap in Canadian startups' knowledge of their own use cases, market landscape, and customers:

> *I always ask if they have done a market study. Are they aware of their competitors? And I think one of the worst answers is there's no competitors, that they are the first ones to do it because I don't believe in that. And then we will talk about traction. And this is where some of the Canadian startups are lacking compared to other startups: that's use cases, actual partners in the industry. Who is going to be your customer? Have you done use cases? What are their comments, and what are you going to do with your product development plan to get more customers?*
>
> – Investment Lead, energy sector and technology FMNE

A startup company has many qualities that make it more or less appealing to potential investors. Aside from a strong product or service offering, these might include:

- The team, how many PhDs, whether a seasoned businessperson is leading or advising[107]
- Existing funding or grants as previous "votes of confidence" in a company
- Cash-to-debt ratio
- Product or service, use cases, business model[108]
- Board of directors
- Confidence, vision, ability to pitch
- Network
- Competition
- Growth plans, revenue trajectory
- Market, clients and customers

Equity and debt have long-term impacts on a company's future investment attraction. Interviewees noted that debt has become more available in Canada in the tech sector, both from Canadian banks and from the Business Development Bank of Canada (BDC). However, success in securing loans varied by subsector: a software as a service (SaaS) interviewee found it easy, while another interviewee who was looking for capital to build a very resource-intensive prototype to prove their technology found it nearly impossible. Similarly, one interviewee found interest rates very high in Canada, prompting them to replace their Canadian debt with European relationships, and eventually move their headquarters to the EU.

107 A 2016 survey of 885 institutional venture capitalists (VCs) at 681 firms found that when making investment decisions, "VCs place the greatest importance on the management/founding team." See: Paul Gompers et al., "How do Venture Capitalists Make Decisions?," September 2016, *National Bureau of Economic Research*, https://www.hbs.edu/faculty/Pages/item.aspx?num=51659

108 A 2016 survey of 885 institutional venture capitalists (VCs) at 681 firms found that "business…related factors were…frequently mentioned as important with business model at 83%, product at 74%, market at 68%, and industry at 31%. The business related factors, however, were rated as most important by only 37% of the firms." See: Paul Gompers et al., "How do Venture Capitalists Make Decisions?," September 2016, *National Bureau of Economic Research*, https://www.hbs.edu/faculty/Pages/item.aspx?num=51659

While debt can be an important part of starting a business, interviewees also voiced concern about COVID's impact on equity markets. In a survey by Vancouver cleantech accelerator Foresight, about half of graduate companies had to pivot to debt funding during COVID-19. Debt may make a company less attractive for future equity investors, therefore constraining their choices of investor and impacting management structure.

> *[My] first startup leveraged AI for compliance and exited to Entrust while [my] second leveraged monies from [my] first exit…and was acquired in 2020 by Genasys. We exited as we had no scale up equity backing. We were only offered debt.*
>
> – Suhayya Abu-Hakima, Innovator, Inventor, and Entrepreneur[109]

Patents may help companies attract funding, but this rule cannot be applied universally. Several startup companies felt that having a patent had acted as a proxy for maturity with early investors, particularly pre-prototype. One interviewee who had been both an entrepreneur and an investor felt that as an entrepreneur, patent registration was rarely useful: it cost money and time, and it was better to simply be first to market. As an investor, however, they felt that it might slow competition down by forcing them to figure out how to get around patent protection, "and then you're ahead enough with commercialization that you're seen as the market leader. On the entrepreneur side, my perspective is, 'Patents? Who cares.' On the investor side, I want a patent." Similarly, one university IP commercialization office noted that in the seed round, angel investors typically wanted to see IP as some "proprietary position that offsets the extraordinary risk they're taking," but that "whether IP ends up being the right product for commercialization, that's neither here nor there."

Another interviewee that began as a product-driven startup but pivoted to being a services company felt that they had registered a patent as a result of poor advice from their university community, that it had ultimately been a waste of time and money. While the patent might have been one extra point in their favour with investors, it was protected prior to market readiness and ultimately had nothing to do with their value offering: If our company runs out of money, we're not going to be able to sell that IP for millions of dollars because it's so valuable—because it's just not." Other services companies echoed similar sentiments, often noting that they could typically license whatever formal IP they required.

109 See: Suhayya Abu-Hakima, "Innovation nation equals entrepreneurship nation: a story from a successful entrepreneur," October 2021, *The Hill Times*, https://www.hilltimes.com/2021/10/25/innovation-nation-equals-entrepreneurship-nation-a-story-from-a-successful-entrepreneur/323419

Existing research on IP, IPRs and financing is also mixed. A 2017 survey of Canadian businesses suggests that firms that are aware of and/or hold formal IP are more likely to experience problems maintaining cash flows than those that are not aware of, nor hold formal IP.[110] IP-aware businesses are more likely to request external financing and will generally obtain higher financing amounts when successful. Together, trends suggest that firms that are aware of and/or hold formal IP tend to have higher financing needs. A 2019 survey of European micro, small, and medium sized enterprises asked why businesses choose to register for IPRs: the third most common reason[111] was that IPRs increase the business' image and value; the fourth most common[112] was that it improves their negotiating position; and the fifth most common[113] was that it improves their chance of obtaining financing (the first and second most common reasons were to prevent copying and ensure legal certainty).[114] Meanwhile, a 2016 survey of 885 institutional VCs at 681 firms asked VCs what factors were most important when making investment decisions, and asked them to rank their responses by order of importance. Notably, IP and IP protections were not specifically mentioned by VCs.[115] That said, several closely related concepts were mentioned, including a company's business model and product offering.

Canadians have to consider differences in investment culture when pitching in the U.S. Canadian investors were described as more relational, responding well to a "bullpen" approach where a company cultivates many contacts and keeps them up to date. Even Canadian "connector" organizations working abroad sought to connect Canadian startups with Canadian expats for this reason. Conversely, the U.S. was described as having more of a "sense of scarcity," wanting less small talk and faster pitches with more confidence.

110 "IP Canada Report 2019," 2019, *Canadian Intellectual Property Office*, https://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/vwapj/IP_Canada_Report_2019_eng.pdf/$file/IP_Canada_Report_2019_eng.pdf

111 Chosen by 36% of micro sized businesses, 35% of small businesses, and 36% of medium-sized businesses.

112 Chosen by 15% of micro sized businesses, 16% of small businesses, and 18% of medium-sized businesses.

113 Chosen by 12% of micro sized businesses, 11% of small businesses, and 15% of medium-sized businesses.

114 "2019 Intellectual Property SME Scoreboard," October 2019, *EUIPO*, https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IP_sme_scoreboard_study_2019/IP_sme_scoreboard_study_2019_en.pdf

115 Paul Gompers et al., "How do Venture Capitalists Make Decisions?," September 2016, *National Bureau of Economic Research*, https://www.hbs.edu/faculty/Pages/item.aspx?num=51659

GBA+ in Investment and Tech

> *Financing is a huge part of the innovation and entrepreneurship ecosystem. Making more room for women and diverse individuals to join the bankers and financiers—who typically keep them out—will make Canada more successful. Some 50 per cent of our population is women paying taxes, yet banks will only offer them business loans against their homes rather than equity—if they decide to fund them at all. Women are a huge resource in this country who innovate and build amazing businesses as entrepreneurs. Why are they not funded? When will this change?*
>
> – Suhayya Abu-Hakima, Innovator, Inventor, and Entrepreneur[116]

A gender-based analysis plus assesses systemic inequalities and how people with different identities experience policies, programs, and other initiatives. While a GBA+ is beyond the scope of this paper, gender and identity appeared as a key theme in several interviews. Interviewees were selected based on three types of expertise.

Note: gender reported here is based on interviewee choice of pronouns on LinkedIn. Demographic information was not collected as a part of this study.

- Third-party policy expertise — 38% women
- Canadian companies with significant IP or FDI expertise — 7% women
- International investors — 18% women
- Interviewees that fall within multiple categories — 40% women

Specifically, three interviewees worked with organizations that sought to support and promote women entrepreneurs and/or women angel investors. Two of these interviewees highlighted gendered experiences in pitching (e.g., gendered mannerisms being read as a "lack of confidence") and called attention to the need for more women in investment to help remedy this issue.

116 See: Suhayya Abu-Hakima, "innovation nation equals entrepreneurship nation: a story from a successful entrepreneur," October 2021, The Hill Times, https://www.hilltimes.com/2021/10/25/innovation-nation-equals-entrepreneurship-nation-a-story-from-a-successful-entrepreneur/323419

> *The controversy around the topic of confidence is saying, well, is the problem really that female entrepreneurs and executives lack confidence, or is it that the male counterparts are not interpreting female body behaviour as confident? And where do we really need to make the change?*
>
> – Serial entrepreneur, former policy advisor, U.S. and Canada

The third interviewee called attention to the lack of women leaders in the tech sector, noting that he saw a trend where women hit a ceiling at a certain point in their careers. All three commented that they felt that having more gender and ethnic diversity in tech leadership and investment would introduce new ways of thinking about the topics discussed in this paper. For example, each of these interviewees felt that greater diversity in tech and investment might promote a more relational approach to striking deals.

> *I've only seen organizations truly thrive when they put diverse voices in management positions. It's the way you're going to have innovation. Most of the time, it comes down to empathy and thinking outside of the money-making box.*
>
> – COO, media FMNE

A recent study on gender and IP highlights challenges faced by Canadian women entrepreneurs when securing financing, including that the majority of venture capitalists are male, women are not as successful in securing scale up funding, and "men are assumed to be the preferred inventors within the IP environment.[117] Future research on these topics should consider explicitly incorporating gender and ethnic diversity in interviewees into study design and consider the intersection of life experiences in decisions to invest, startup, scale, expand into Canada, or move abroad.

117 Myra Tawfik and Heather Pratt, "Study of the underrepresentation of women and women-identifying IP-rights holders, company founders, and senior leadership," 2021, *University of Windsor*, https://www.ipcollective.ca/wp-content/uploads/2021/12/Study-on-Women-in-IP-ENG.pdf

Having Canadian or U.S. investors might impact the rate of return investors expect, as well as how quickly investors push a company to sell. In part due to the relatively small amount of capital available, interviewees reported that Canadian VCs were more likely to push for a five-year lifespan and a quick return on investment. Similarly, Canadian investors were more likely to give lower, conservative valuations, less money, and more scrutiny.[118] On the other hand, VC in Silicon Valley is a "seven-to-ten-year marriage" where investors are looking for a high return of 20-30 times their investment. Accordingly, Canadian VCs might put pressure on a new company to work toward acquisition rather than scale further. A 2018 study by the University of Toronto Impact Centre follows these anecdotal trends.[119] Comparing 983 companies from five countries that were founded in 2008, the study finds that, when compared to their U.S. counterparts, Canadian companies take longer to obtain their first round of financing; go through fewer rounds of financing overall; and "raise significantly less money before exiting."

An important caveat is that not all innovative companies require seed and startup funding, or not to the same degree. Some interviewees in services companies had grown through bootstrapping, building their client base, attracting grants, and taking loans where needed. These "organically grown" companies were not "on the clock to exit" like some of their product-driven peers.

Interviewees felt that there was less startup and scale-up capital available in Canada than in other countries. Few Canadian investors are big enough to provide Series B or C funding. They observed many companies needing to move abroad or sell as they scaled. Several interviewees noted that their concern therefore extended past the "valley of death" (the financing gap between R&D and product commercialization) to "scaling" or "growth" capital (e.g., VC and angel investment, incubator funding, private equity, and commercial bank loans).

A 2020 report by Innovation, Science and Economic Development Canada (ISED) on the availability of capital to Canadian growth-oriented, medium-sized firms outlines a three-tier growth capital financing market in Canada: Tier One, with investors that typically seek deals above the $20-million-mark; Tier Two, with investors that typically invest around the $10-million-dollar mark; and Tier Three, with investors that typically invest between $2 and 5 million per deal.[120] Among these tiers, the study finds that while Tier Two contains a comprehensive selection of Canadian investors, Tier One mainly consists of U.S. Funds and in Tier Three, there is not enough growth capital to meet demand.

118 One interviewee noted that in Canada, there is high competition among startups for limited available funding. Meanwhile, in the United States, there is high competition among VCs for good startups. This interviewee theorized that these different environments give Canadian businesses less leverage when negotiating deals with Canadian investors, as compared to US investors.

119 'The Class of 2008: Insights from 983 tech companies founded in 5 countries in 2008," May 2018, *University of Toronto Impact Centre*, https://narwhalproject.org/wp-content/uploads/2019/04/The-Class-of-2008.pdf

120 "Access to capital for Canadian growth-oriented, medium-sized firms," 2020, *Government of Canada*, https://www.ic.gc.ca/eic/site/061.nsf/eng/h_03133.html

According to one interviewee from the ISED study:

> *Not too many firms or funds are feeding the capital needs of companies that are too small to attract the interest of the U.S. majors, too low growth to attract venture capitalists, too small for traditional private equity funds and banks.... If you have under $5 million of earnings before interest, taxes, depreciation and amortization and you're growing at 5%–10% above the consumer price index, then there are few places to turn to....*

Similar comments were made by interviewees in this study:

> *Canadian companies often reach a certain size and then get bought because they've got something where the value is such that we don't have the capacity here. I don't think we have enough investors to invest in Canadian companies and keep them here. Canadian companies themselves have very low rates of in-house R&D, so they ride on a technology, they're successful, and their mindset is not to develop new product lines but to find someone to sell to and take the packet of money.*
>
> – Professor, subject matter expert

> *So, it's an incredibly huge indictment on the fact that, as I say, we talk a big story, but in Canada and in Alberta, there's lots of pre-funding, pre-technology, pre-market funding, or innovation funding. But as soon as you need more than a million dollars, forget it. And the investment community here is generally woeful.*
>
> – President, clean technology sector Canada

> *We've got a very strong and growing VC capability, but the VCs try to get out early, and I think there's not enough Business Development Bank of Canada funding, or other funding that can help keep companies in Canada.*
>
> – Research institute, Canada

More promisingly, despite these comments (made in early 2021), 2021 was a record setting year for Canada in terms of annual VC investment. According to the Canadian Venture Capital Association (CVCA), as of Q3 2021, $11.8 billion worth of venture capital funding had been invested in Canadian startups, surpassing the previous record of $6.2 billion, set in 2019.[121] The growth in funding was a result of larger investment rounds overall, and more investment in later and growth-stage companies: the average deal size during the first three quarters of 2021 was $20.7 million, nearly double the 2019 average. According to the CEO of the CVCA, "investment in Canada's startups has never been stronger."[122]

As Canadian startups bring in investment dollars and get "on the clock" for exit and VC ROI, one health technology interviewee noted that IP played a big role in how much companies would eventually sell for. In the interviewee's subsector, IP might comprise about half the value of a company's sale. A foreign investor who monitored the software landscape for solutions that would enhance their platform noted that IP (including trade secrets, not necessarily formally registered IP) was essential to their due diligence when considering an acquisition:

> *If we buy a company, one of the things we always do is to determine if there is some free version out there because if you're going to spend tens of millions of dollars for technology that's out in the public domain, then it's theoretically worthless. It depends on what your model is, but it's definitely something you need to know before you buy a company.*
>
> – Head of Procurement, tech sector FMNE

Why else would a foreign investor pursue an M&A or make M&As part of their growth strategy? M&As can help foreign investors:

- Grow market share or gain access to new distribution channels, markets, networks, and products
- Obtain new capabilities, technology, know-how, or talent
- Lower the costs or risks associated with R&D
- Capture operational synergies, such as increased scale or scope, revenue growth, or organizational transformation.[123]

123 "Guide to Mergers and Acquisitions," 2016, Protiviti Risk and Business Consulting, https://www.protiviti.com/sites/default/files/united_states/insights/guide-to-mergers-acquisitions-faqs-protiviti.pdf

Acquisition-driven Canadian tech companies will often sell to a foreign acquirer. For example, among a sample of 2,500 M&As involving Canadian information technology companies, 46% of the M&As involved a Canadian acquirer, while 54% involved a foreign acquirer.[124] The reason why few acquirers are Canadian may again have to do with business density, market size, and critical mass.

Few sectors in Canada have big enough companies to act as what some interviewees referred to as "strategics," companies that have grown to a size where they actively monitor and acquire strategic technologies that will enhance their portfolio or product.

> *A lot of us buy other companies because it's faster and adds more value to our platform than building the same solution ourselves. When we bought [company] they already had connector APIs, and then we baked it into our core suite. If there's value we can extract and provide back to our customer, then we will invest.*
>
> – Head of Procurement, tech sector MNE

Furthermore, if a Canadian company is acquired and moved, its talent may also need to move for new opportunities if there aren't enough companies in their sector in their part of Canada. With greater business density in more Canadian cities, acquisitions would be more likely to result in reinvestment in the same community.

Interestingly, one large Canadian telecommunications company noted that some of their smaller peers "desperately want us to buy them" to allow them to stay in Canada, however, the telecom has to compete with other tech companies that "pay egregious amounts of money for companies based on their perceived IP value" and some of those companies "sell for 15 times their revenue projections but are losing as much money as they make." This interviewee noted that they preferred to acquire companies that were at least breaking even. Accordingly, a second component of this issue may be that where large Canadian companies do exist, they are still (likely by necessity) looking for greater certainty than international equivalents. Much like Canadian VCs, large companies in Canada may become more conservative due to the general dearth of capital availability in the ecosystem.

124 To be included in the sample, the company had to be listed as operating in the information technology sector on Pitchbook; the headquarters of the company that was acquired had to be located in Canada; and the location of the acquiring company's headquarters had to be listed. The location of the acquiring company's headquarters was not listed for 225 of the M&A deals: these deals were thus excluded from the calculations. Data accessed on Pitchbook on August 27th, 2021.

Foreign M&As have varied labour market impacts, with evidence of net job creation in research from the 2000s. Foreign acquisitions are often more controversial than greenfield investment in part due to situations where M&As "hollow out" a company if the foreign acquirer moves operations back to its home country. Existing literature can shed some light on this contention, though it is important to note that this data is not sector specific, nor particularly recent. In 2005, there were three domestically controlled head offices for every one foreign-controlled head office in Canada. About one in five (21%) foreign takeovers of domestic head offices involved a consolidation to the firm's home country, resulting in a loss of 1,709 jobs. However, other foreign takeovers resulted in an additional 2,346 jobs and the creation of 38 new head offices.[125] A 2008 study found that foreign-controlled companies in Canada may "lose out in terms of corporate governance and senior management functions" but may gain "employment, operations, capital, and community relations."[126] In other words, the impact of foreign acquisitions on Canadian head office activity and employment is varied, with evidence for aggregate job creation in research from the 2000s.

While some interviewees emphasized that acquisition is a trend in tech writ large—not limited to Canada—the fact that major acquirers and earlier-stage investors are primarily *not* Canadian still results in an exodus of Canadian companies that have to look elsewhere for opportunities. For example, some interviewees that would have preferred to remain a CCPC and scale in Canada were not able to do so.

> *"In our case it was death by a thousand cuts—it was a bit disappointing that the capital markets in Canada really didn't show up for us during those years, despite the federal government really showing up from an R&D funding perspective. We have five major owners now. There was a major funding round as each of them joined, and none of them were from Canada. I guess it's more like survival and then thriving by five cuts. It's business, we had to go where we had to go. And we still have over half of the jobs in Canada."*
>
> – VP, clean technology sector, Canada

125 Mark Brown and David Beckstead, "Head office employment in Canada, 1999 to 2005," Canadian Economic Observer: Economic Events, accessed June 7, 2021, https://www150.statcan.gc.ca/n1/pub/11-010-x/00706/9272-eng.htm.

126 Laura Dawson, "Potash and BlackBerries: Should Canada Treat All Foreign Direct Investment the Same?," June 2012, The Macdonald-Laurier Institute, https://www.macdonaldlaurier.ca/files/pdf/Should-Canada-Treat-All-FDI-The-Same-Commentary-June-2012.pdf

The Role of Private Investment in Carbon Capture, Utilization, and Storage in Canada

In the clean technology subsector, companies attempting to start up, patent, partner, and scale face several considerations that mediate choice of location above and beyond those of companies whose assets are entirely intangible. Interviewees working in clean technology, either as companies or investors, voiced the following differences between cleantech and intangible sectors like software:

- A long development cycle, hardware, and technology constraints
- Less ability to travel for pitches or client meetings (due to demonstrations being location-specific with hardware constraints)
- Different indicators of early success, such as first clients rather than monthly active users
- A significant scaling capital plateau when moving from product to mass production
- In considering target markets, natural resource availability, renewable energy incentives and/or procurement
- Domestic or international utilities acting as lobby groups and crowding out smaller companies
- Specialized industrial expertise that may lend itself to FDI rather than licensing: "If you're looking at larger structural investments like a water purification plant, for example, it's still possible to license the technology, but for the recipient country, it's probably better to have the company still be involved because of their specialized operating and installation knowledge"

Clean technology is a large and ambiguously defined field, so this case study will focus on Carbon Capture, Utilization, and Storage (CCUS) technologies to explore the relationship between FDI and IP in a tech subsector with significant tangible needs and assets. CCUS includes the following groups of technologies:

- Carbon capture prevents CO2 from going into the atmosphere during exhaust-creating processes, or uses direct air capture (DAC) to extract and capture carbon from the air
- Carbon utilization and conversion turn CO2 into useful products. This includes use in enhanced oil recovery (EOR), where captured CO2 is used to produce more oil with lower emissions, and sequestration in concrete products
- Carbon storage is typically subsurface, requiring particular geological conditions (found widely in Canada) to inject carbon deep underground and then monitor it for leaks[127]

127 Dr. Don Lawton, "On the path to a net-zero carbon economy: carbon capture, utilization and storage," presentation at The Partnership Group for Science and Engineering, May 13, 2021.

CCUS technologies are attracting unprecedented attention: many global climate change mitigation plans include CCUS as one of many essential steps to reducing greenhouse gas emissions by 2050.[128] Canada in particular is well-positioned to lead in CCUS technology for many reasons, including its engineering expertise, research centres and R&D funding, and carbon pricing. Not least, Canada has significant carbon capture and storage infrastructure, including one of the largest CO_2 pipelines globally.[129] The R&D footrace is on, but attracting sustainable investment is an ongoing challenge.

The Canadian CCUS Ecosystem

- Canada has 11 CCUS R&D centres, housed mostly in Alberta, Saskatchewan, and BC, by universities and not-for-profits[130]
- Canada has five test and scale-up facilities across the same four provinces, which focus primarily on technology validation and support for pilots and are primarily hosted by not-for-profits and crown corporations
- Canada is home to five large-scale CCUS facilities, all in Alberta and Saskatchewan
- Canada ranks among the top four jurisdictions for CCUS patents, suggesting that international CCUS players regard the Canadian market as competitive [131]

CMC Research Institutes and Foresight identified a list of opportunities for Canadian CCUS companies to examine when considering international exports, including government funding and regulatory support for CCUS, existing or upcoming projects; prominent corporations with a demonstrated interest in CCUS; and key industrial point source emissions (to gauge emissions reduction demand and type of technology needed).[132] The report also sees an opportunity in strategic partnerships between Canadian SMEs and large multinationals, such as "companies with emissions reductions mandates looking to adopt your technology, or companies looking to add your technology to what they offer their consumers."[133]

128 Alireza Talaei, *The CarbonTech Innovation System in Canada*, University of Alberta, 2020, p.6.

129 Alireza Talaei, *The CarbonTech Innovation System in Canada*, University of Alberta, 2020, p.7.

130 Alireza Talaei, *The CarbonTech Innovation System in Canada*, University of Alberta, 2020, p.16.

131 *"In terms of the number of CCS patents granted, Canada is among the top four jurisdictions globally, with 332 of the world's 2,325 total, or 14% behind the U.S. (708 patents), China (663 patents) and European Patent Office (441 patents) [124]. In CO2 utilization, (including both EOR and carbontech pathways), Canada holds 253 patents (representing 8% of the global carbontech patent pool as reported in 2017) placing the country third after the United States (1,222) and China (395) [125]. In terms of focus areas, 90% of Canadian carbontech patents are in EOR and in CO2 to chemicals or fuels, split roughly equally, with the remaining 10% primarily in CO2 mineralization [125]."* Alireza Talaei, *The CarbonTech Innovation System in Canada*, University of Alberta, 2020, p.16.

132 CMC Research Institutes and Foresight, Exporting CCUS technology, March 2021, https://cmcghg.com/exporting-canadian-ccus-technology/ p. 13.

133 CMC Research Institutes and Foresight, Exporting CCUS technology, March 2021, p. 14.

As discussed in the section on market, mass, and maturity, and private investment, there are frequently not enough clients and large investors for Canadian companies to successfully scale at home. The CCUS ecosystem is a unique example because CCUS relies in part on energy sector funding, in which Canada is strong. Furthermore, as one interviewee noted, investment in CCUS from the energy sector is likely to involve procurement rather than an M&A led by a competing technology company:

> *"They don't want to own the IP for CCUS. They want to apply it, drive down their costs, and meet their ESG requirements. So they're actually really nice partners for the little guys starting up because there's no threat of that takeover of technology."*
>
> – Clean technology organization

ICTC compiled a list of Canadian CCUS organizations from ecosystem reports and other literature, interviewee insights, and patent analysis of Canadian organizations that hold CCUS-related IP in CIPO or USPTO. CCUS patent holders included Canadian universities, crown corporations, privately held and publicly held companies, and individuals unattached to companies. To answer the question *from what sources do startup and scale-up CCUS technology companies access capital, and at what stages,* ICTC further narrowed down the list to privately held companies that primarily focus on CCUS technology and have information available about their funding and investment histories.

The CCUS startup group described above accessed both Canadian and American funding, as well as some funding from Asia and the EU. Numerous Canadian grants and prizes tend to be involved, and while there are Canadian investors at all stages of a company's maturity, they typically offer less on average than their American peers. However, many large energy sector players in Canada and internationally are also contributing to the CCUS startup ecosystem. Breaking this down further, some companies follow a well-known path toward funding and scaling up using VC Series funding, while others have thus far successfully bootstrapped their startups from personal investment through a series of grants and accelerators. Carbon Upcycling Technologies' path, for example, has been comprised entirely of accelerators and incubators, personal investment from its founders, and grants and prizes from organizations such as Emission Reduction Alberta, Natural Sciences and Engineering Research Council of Canada (NSERC), National Research Council of Canada (NRCC), Shell Canada, and the Carbon X-Prize.[134]

134 Data gathered from Pitchbook.con, August 18 2021.

Pre-Seed Opportunities Accessed	# of Orgs	Average Funding in millions $	Top Programs #1 Most $ Invested or Most Frequent Program Accessed
Grants and Prizes Canada	12	0.95	Emissions Reduction Alberta
Accelerators and Incubators	14	N/D	Innovate Calgary & Techstars Energy Accelerator
Seed/Early-Stage Investors			
Angel and VC	5	0.95	Atco
Angel and VC U.S.	3	4.97	Creative Ventures
Accelerators and Incubators	1	0.75	Fundable
Post-Seed Opportunities Accessed			
Grants and Prizes	10	1.90	Emissions Reduction Alberta
Grants and Prizes	2	2.00	XPRIZE
Accelerators and Incubators	8	N/D	Canadian Technology Accelerator
Series A / Early-Stage Investors			
Investors	6	4.75	Sustainable Development Technology Canada (SDTC)
Investors	3	10.78	The Roda Group
Other	1	7.80	Synergy Growth
Post-Series A Opportunities Accessed			
Grants and Prizes	6	4.60	SDTC & Western Economic Diversification Canada
Accelerators and Incubators	1	N/D	Canadian Technology Accelerator
Series B/Later Stage Investors*			
Investors	15	19.99	Suncor Energy
Investors	18	21.55	BNC Bank
Other (EU, Asia)	3	N/D	Sinobioway Group
Debt Accessed After Series B			
Government	1	25.00	Canadian Federal Government
Government	1	80.00	U.S. Depts of Agriculture and Energy
Private	2	35.00	Integrated Asset Management Corp
Post-Series B Opportunities Accessed			
Grants and Prizes	2	22.75	U.S. Dept of Energy
Accelerators and Incubators	1	Data insufficient	Elemental Excelerator
Series C & D/Later Stage Investors			
Investors	7	Data insufficient	BDC
Investors	9	Data insufficient	Chevron Technology Ventures
Other (EU, Asia)	4	Data insufficient	Temasek Holdings

Table 3: The funding lifecycle of privately held Canadian CCUS companies. Data gathered from Pitchbook.com, Aug 18, 2021.
* When data only shows total value for a funding round, value estimated by dividing equally between lead investors.

For privately held Canadian CCUS companies, patenting is likely associated with age and valuation: for example, the median age of privately held Canadian CCUS-related companies with valuations over $50M Canadian is 15 years, with a median of 8 USPTO patents (active or pending).[135] However, companies of all stages have chosen different R&D and IP strategies: for example, two businesses that have relatively high valuations and have existed for over 15 years hold no patents at all.

All told, Canada is offering important support to CCUS startups, including grants, prizes, and accelerators. As companies scale, many of them access funding from the Canadian energy sector or Canadian VCs while many others look to capital from the U.S. or other countries. An analysis of funding sources throughout company life-cycles suggests that even in the energy sector, where Canada has an advantage, startups and scale-ups need to look abroad for larger investors as they grow. As this paper has thus far described, lack of access to scale-up capital may drive companies to early exits or cause them to move operations and jobs outside of Canada. Energy sector companies procuring CCUS technology to meet ESG requirements or carbon targets are more likely to help a company scale their technology and access international markets than a large technology sector competitor looking for strategic IP. Accordingly, greenfield FDI has an important role to play in strengthening Canada's CCUS ecosystem through procurement, vertical knowledge spillovers that build entrepreneurial experience, and new market access.

135 CCUS company n = 17. Median patents for companies under $5M Canadian is 1, and median age is 7 years.

Government Regulation, Funding, and Innovation Infrastructure

Regulation and Procurement

Government regulation and procurement policy play key roles in the innovation ecosystem. Like other variables, a favourable or unfavourable regulatory environment necessarily incentivizes companies to stay in Canada, leave Canada, or come to Canada. Interviewees with a variety of perspectives discussed trends in regulation that had guided their decisions to develop and commercialize IP, scale, move, or take an early exit.

Procurement, competition, and highly regulated industries impact emerging technology companies' desire to remain in Canada. Regulatory impacts vary significantly by industry. For example, a fintech interviewee noted that they would almost certainly leave Canada due to an unfavourable regulatory environment. Other highly regulated sectors—such as telecommunications or healthcare—voiced similar inclinations, particularly when piloting an emerging technology that was not yet recognized by the large companies that dominate these spaces. These companies felt that procurement in Canada did not favour innovation, primarily because of regulatory circumstances.

> *In the regulated spaces, like finance, telecom, agriculture, retail, we have a monopsony/oligopsony problem. There's no reason for these companies to buy innovative services or products from enterprise vendors because if you don't have competition, you don't really have to compete.*
>
> – Research institute, Canada

> *There's lot of support to make technology [referring to IRAP, SR&ED, superclusters] but there should be more stimulation of the customer base. Maybe that's partly government procurement, but more likely that's incentivizing enterprise customers in Canada to buy new technology.*
>
> – Medical technology CEO, Canada

While some interviewees felt that federal procurement did not adequately support health technology, another noted that Canada was a strong place for healthcare experimentation, such as pilot studies and trials. Similarly, an interviewee who worked to facilitate FDI noted that Canada had a good international reputation for creating innovative healthcare technology and processes.

One interviewee noted that a possible way to help Canadian startups scale is prioritizing public procurement over other types of public funding such as repayable contributions (e.g., loans). Repayable contributions, like those provided through the Strategic Innovation Fund (SIF), show up as debt on company balance sheets, whereas procurement opportunities represent an income stream. Accordingly, these two types of funding can have very different impacts on a startup's valuation, and in turn, their ability to obtain private sector funding. Similar comments were made in a recent blog post by a Canadian CEO:

"A lot of innovation policy in Canada has focused on providing support directly to innovative companies, either through tax credits or direct funding. That's appreciated, but funding my customers… provides multiple benefits. I can compete for the business. If I win the business, I potentially get a reference customer and I book revenue, which is helpful when privately raising investment capital."[136]
For other companies that were in Canada but chose to leave, sudden regulatory changes—like the repealing of the Green Energy Act in Ontario[137]—led them to rapidly shift to a more favourable environment. As discussed throughout this paper, FDI business ecosystems and the health of Canadian business activity are intimately interrelated. A lack of healthy business activity in Canada impacts our market's maturity and capital availability. Furthermore, greater business activity would improve our ability to attract market access FDI.

Regional Trade Agreements and IP Rights

IP rights (IPR) regimes play a role in FDI attraction. Because FMNEs need to protect their property in host countries, strong IP rights protections are considered to be an important determinant of FDI.[138] However, IPRs to prevent local copying are more important for particular sectors (e.g., pharmaceuticals, chemicals, software).[139] Industries that are employment-intensive and trade-intensive may have an increased threat of local imitation (products that are seen by more eyes are more likely to be copied).[140] One study illustrates that in countries with formal IPRs but reputations for a lack of enforcement, U.S. investors tend to factor in this lack of IP enforcement in their FDI location decisions.[141] For developed economies, stronger IPR protection seems to increase R&D expenditure from U.S. affiliates: however, at a certain point, strong IPR protection may result in licensing over FDI relationships (i.e., if IPRs are strong enough in principle and in practice, a FMNE might feel confident in licensing out its IP for companies in another country to use rather than creating or acquiring its own facilities).[142] A FMNE's decision to export to another country, licence within that country, or pursue FDI instead also interacts with transport costs and tariffs.[143]

136 Kurtis McBride, "What it Would Look Like if Canada Strategically Invested in Itself," October 2021, *LinkedIn*, https://www.linkedin.com/pulse/what-would-look-like-canada-strategically-invested-itself-mcbride/

137 "An Act to repeal the Green Energy Act, 2009 and to amend the Electricity Act, 1998, the Environmental Protection Act, the Planning Act and various other statutes," Government of Ontario, December 6, 2018, https://www.ontario.ca/laws/statute/s18016.

138 Keith E. Maskus, "The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer Symposium: Public and Private Initiatives After Trips," *Duke Journal of Comparative & International Law* 9, no. 1 (1999 1998): 109–62.

139 Ibid.

140 Peter Nunnenkamp and Julius Spatz, "Intellectual Property Rights and Foreign Direct Investment: A Disaggregated Analysis," Review of World Economics 140, no. 3 (September 1, 2004): 393–414, https://doi.org/10.1007/BF02665982.

141 Nikolaos Papageorgiadis et al., "The Characteristics of Intellectual Property Rights Regimes: How Formal and Informal Institutions Affect Outward FDI Location," International Business Review 29, no. 1 (February 1, 2020): 101620, https://doi.org/10.1016/j.ibusrev.2019.101620

142 Peter Nunnenkamp and Julius Spatz, "Intellectual Property Rights and Foreign Direct Investment: A Disaggregated Analysis," *Review of World Economics* 140, no. 3 (September 1, 2004): 393–414, https://doi.org/10.1007/BF02665982.

143 Keith E. Maskus, "The Role of Intellectual Property Rights in Encouraging Foreign Direct Investment and Technology Transfer Symposium: Public and Private Initiatives After Trips," *Duke Journal of Comparative & International Law* 9, no. 1 (1999 1998): 109–62.

IPR Strength Impacts Technology Transfer and Knowledge Spillover Effects. A natural side effect of strong IPRs encouraging FDI is that strong or weak IPRs also impact the types of technology transferred by foreign firms to the host country. In a study from the 1990s, U.S. investors were asked to comment on the importance of IP protection in FDI decisions. To invest in sales and distribution, about 20% said IP was important. For rudimentary production and assembly, 30%; facilities for more complete manufacture, 55%; R&D facilities, 80%.[144] Accordingly, strength of IPRs is likely to affect not just the quantity of FDI but also its composition.

Regional Trade Agreements also influence FDI, in part through IPRs. When discussing regional trade agreements, FDI interviewees most frequently mentioned labour mobility provisions—programs that allowed international visas to be obtained easily (facilitating skills transfer)—as core parts of their FDI decision-making. Interestingly, one study of regional trade agreements (RTAs) and FDI finds that in aggregate, RTAs only impact intra-RTA FDI (increased investment within the group of country signatories) if they have embedded IPRs. This study's model suggests that "a change from no IPR to maximum IPR content [in a trade agreement] is associated with a 39-45% increase in FDI."[145] It also found that regional IPR protection was much more important in North-North FDI than North-South FDI.[146]

Patent Boxes

A patent box, innovation box, or knowledge development box is a policy tool used by governments to incentivize commercialization of locally generated IP and attract innovation-focused FDI. Through a unique tax regime, it provides regional corporations a reduced tax rate (often around 10%) on income derived from qualifying IP (often patents and software copyrights). While many EU member states and other countries, such as Korea and China, have implemented patent box regimes, Canada does not currently have one at the national level,[147] nor does the United States.

In this study, interviewees from two companies in medical devices and health sciences suggested patent boxes as a way to keep their companies in Canada and attract further FDI, commenting that patent boxes encourage long-term investment because manufacturing infrastructure and talent, once established, become hard to move. One interviewee noted that "Australia just implemented a patent box, and literally in the last seven days, a patent box-like regime for biotech has made us change where we were going to hire our next talent."

144 Edwin Mansfield et al., Foreign Direct Investment, and Technology Transfer, 1994.

145 However, the relationship depends on the type of IPR. FDI is positively associated with: TRIPS reaffirmation, National Treatment, Copyrights and Trademarks, Trade Secrets and Knowledge, and Encrypted broadcast signals. FDI is negatively associated with: Enforcement and Dispute Resolution, Patents and Designs, and Domain Names. Sucharita Ghosh and Steven Yamarik, "Do the Intellectual Property Rights of Regional Trading Arrangements Impact Foreign Direct Investment? An Empirical Examination," International Review of Economics & Finance 62 (July 1, 2019): 180–95, https://doi.org/10.1016/j.iref.2019.03.002.

146 Ibid.

147 However, "British Columbia implemented [a patent box] at the province level in 2006 and maintained it until 2017. British Columbia's International Business Activity (IBA) program provided a tax refund to eligible BC businesses for international business expenses related to patents." A similar regime is being piloted by the province of Quebec: the incentive deduction for the commercialization of innovations in Quebec (IDCI), which allows eligible companies (i.e., those with "qualified IP assets"), that are established in Quebec and have incurred eligible R&D expenditures, to be taxed provincially at 2% (the current Quebec general income tax rate is 11.5%, and the federal tax is an additional 15%). See: Alexandra Cutean et al., "Bolstering Growth: The Next Frontier for Canadian Startups," Information and Communications Technology Council, 2020, https://medium.com/digitalthinktankictc/bolstering-growth-44707bb09bb0

The same company was told by its tax lawyers to move IP out of Canada because the tax regime is unfavourable. The interviewee noted that each of the "big 5" consulting companies had given them similar advice, and voiced concern that Canadian IP held by CCPCs would also exit the country once they scaled to a size capable of tax planning.

The Investment Canada Act

The Investment Canada Act (ICA) provides two processes for federal review of FDI: a national security review and a net benefit review, the latter of which comes with a financial threshold. The ICA replaced the Foreign Investment Review Act (1974), which required a review of all FDI. The ICA liberalized FDI policy, particularly by allowing greenfield investments in "exempt" sectors without federal review.[148] The ICA was revised in 2009, with a raised financial threshold and strengthened provisions for national security.[149]

In recent years, the Investment Canada Act has been under debate by innovation policy stakeholders and at the Parliament of Canada. Two papers published in 2017[150] and 2018[151] by the Centre for International Governance Innovation (CIGI) state that "Canada's understanding and approach to inbound tech FDI remains rooted in the industrial era understanding of the role and impact of FDI," an exact opposite approach to FDI is being taken by successful innovation economies around the world, and FDI policy must take into account competition policy and the potential negative effects of inward-bound M&As.

A 2019 paper published by the Public Policy Forum (PPF) asks whether it is "time to rethink our foreign investments strategies," as certain kinds of FDI may play an "extractive" role.[152] However, due to conflicting suggestions from stakeholders, the authors are somewhat inconclusive about next steps:

> *"In our consultations, we heard that a fundamentally different approach to thinking about foreign investment in the intangibles economy is needed. Some argued that Canada needs to lift foreign ownership restrictions in order to promote more competition in the economy. Others argued that our foreign investment regime should better support domestic firms in the intangibles economy."*

148 Daniel Shapiro and Steven Globerman, "Foreign Investment Policies and Capital Flows in Canada: A Sectoral Analysis," Journal of Business Research, Foreign Direct Investment, 56, no. 10 (October 1, 2003): 779–90, https://doi.org/10.1016/S0148-2963(02)00466-6.

149 House of Commons Standing Committee on Industry, Science, and Technology, "The Investment Canada Act: Responding to the COVID-19 Pandemic and Facilitating Canada's Recovery," March 2021.

150 Dan Ciuriak, "Industrial-era Investment Strategies Won't Work in a Data-driven Economy Dan Ciuriak", November 15, 2018, CIGI, https://www.cigionline.org/articles/industrial-era-investment-strategies-wont-work-data-driven-economy; Dan Ciuriak, "The Knowledge-based and Data-driven Economy: Quantifying the Impacts of Trade Agreements," December 2017, Centre for International Governance Innovation, CIGI Papers No. 156.

151 Dan Ciuriak, "Rethinking Industrial Policy for the Data-driven Economy," October 2018, Centre for International Governance Innovation, CIGI Papers No. 192.

152 Robert Asselin and Sean Speer, "A New North Star: Canadian Competitiveness in an Intangibles Economy", April 2019, Public Policy Forum, https://ppforum.ca/wp-content/uploads/2019/04/PPF-NewNorthStar-EN4.pdf

Nonetheless, they broadly conclude that Canada should promote competition and FDI, while also ensuring that the Investment Canada Act's net benefit test properly considers the impact of FDI transactions on the broader innovation ecosystem, the role of data and IP in FDI transactions, and the intricacies of more sensitive industries (such as AI).

In 2020, the Standing Committee on Industry, Science, and Technology published a report[153] on the Investment Canada Act. As with the Public Policy Forum study, the Committee heard diverse and divided opinions from expert witnesses. The report included recommendations on how to "improve the treatment of intangible assets under the net benefit review process" and "protect strategic sectors," and encourages "Canadian entities to keep ownership of intangible assets derived with federal funds, including IP."

In April 2020, the Government of Canada issued an updated policy statement[154] and, in March 2021, updated investment review guidelines.[155] The guidelines list areas of investment that could pose national security concerns—for instance, the transfer of sensitive personal data outside Canada, the transfer of sensitive technology (advanced materials and manufacturing, aerospace, AI, biotechnology, medical technology, quantum science, etc.) outside of Canada, and investments by state-owned or state-influenced investors.

153 "The Investment Canada Act: Responding to the COVID-19 Panedmic and Facilitating Canada's Recovery," March 2021, House of Commons, https://www.ourcommons.ca/Content/Committee/432/INDU/Reports/RP11176192/indurp05/indurp05-e.pdf

154 "Policy Statement on Foreign Investment Review and COVID-19," April 18, 2020, *Government of Canada*, https://www.ic.gc.ca/eic/site/ica-lic.nsf/eng/lk81224.html

155 "Guidelines on the National Security Review of Investments," March 24, 2021, *Government of Canada*, https://www.ic.gc.ca/eic/site/ica-lic.nsf/eng/lk81190.html

FDI, IP, and Public Funding in Canada's AI Ecosystem

> *As intangible assets represent an increasing share of income derived from global production and are key drivers of productivity and growth, there is a need to identify trade, investment, innovation, and industrial policies that can attract and retain intangible capital.*
>
> – OECD[156]

A pressing challenge for Canada's AI innovation ecosystem is that Canadian innovators do not own a lot of IP relative to the amount that they create. A 2019 report[157] by the Institute for Research on Public Policy (IRPP) found that Canadian inventors tend to transfer their patents to foreign firms, as opposed to commercializing and scaling their own innovations. The authors investigate U.S. patent filings with Canadian inventors across four key innovation areas (information and communications technologies, aerospace, pharmaceuticals, and AI) and find that AI patents see the greatest drop from "inventorship" to "ownership."[158] Just 7% of AI patents stayed with the original Canadian inventor, and just 40% stayed with a Canadian entity (importantly, the latter figure includes Canadian subsidiaries of foreign multinationals).[159] The authors note that while early-stage IP sales could potentially fund future R&D projects, inventors may risk foregoing late-stage IP, employment, or productivity gains.

Being acquired or bought out is also a common form of "exit" for Canadian AI startups. Among a sample of 209 Canadian AI startups that have exited, approximately 50% were either acquired or bought by another company[160], and of these, just under 60% were purchased by a foreign entity. The second most common form of exit was going out of business (24%), followed closely by going public (19%).[161] Interestingly, in 2019, the World Intellectual Property Office (WIPO) identified Canada as having the third-highest number of acquired AI companies, ahead of AI-economic-powerhouses like Israel, Germany, France, and India.[162]

156 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

157 After investigating more than 9,000 patents granted by the USPTO in 2017 where there was at least one Canadian resident inventor, the authors found that 45% of the patents were immediately assigned to a foreign entity, while a significant portion were later reassigned or sold off. See: Ibid.; Nancy Gallini and Aidan Hollis, 2019

158 IP ownership refers to Canadian ownership of IP; while IP inventorship refers to IP invented by Canadians. See: Gallini, N., and Hollis, A., "To Sell or Scale Up: Canada's Patent Strategy in a Knowledge Economy," August 2019, IRPP, https://irpp.org/wp-content/uploads/2019/08/To-Sell-Or-Scale-Up-Canadas-Patent-Strategy-in-a-Knowledge-Economy.pdf

159 Ibid. Gallini, N., and Hollis, A., 2019

160 Based on a sample of 209 Canadian AI startups that have "exited," meaning they have undergone a qualifying transaction (e.g., M&A, Buyout, IPO/Reverse IPO, Bankruptcy, Out of Business, and Secondary Private Transaction. Dataset compiled using Pitchbook data.

161 It is possible that the number of startups that have gone out of business is underrepresented due to the added difficulty of accounting for companies that are no longer active.

162 Qualifying acquisitions took place from 1998 to 2019. See: Technology Trends 2019; Artificial Intelligence," 2019, World Intellectual Property Office, https://www.wipo.int/edocs/pubdocs/en/wipo_pub_1055.pdf

Within this dataset, there is also a correlation between Canadian AI startups having patent and trademark holdings and the acquisition of these startups by American entities. For example, among the dataset of 209 Canadian AI startups, half (51%) of the startups that were acquired by a U.S. entity held at least one patent filing. By comparison, of startups that were acquired by a Canadian company, about a quarter (24%) held at least one patent filing. Similarly, 58% of U.S.-acquired startups held a trademark filing, compared to 45% of Canadian-acquired startups.[163]

The IRPP report cautions that "public funds that support early-stage research may end up providing a foundation for profits and tax revenues in other countries."[164] Interestingly, among the dataset of 209 Canadian AI startups, at least 44 were acquired at exit and received public funding: of these 44 companies, those that were acquired by an American company (as opposed to Canadian) at exit received on average just under twice the amount of public funding.[165]

Figure 9 provides more detail about the startups in the dataset at the time of acquisition: the size of their M&A transaction, how much funding they had raised, the number of fundraisings deals they had undertaken, the number of patent filings they held with CIPO and the USPTO, the number of jurisdictions they held trademarks in, and the amount of non-repayable government funding they had received from the Government of Canada. Each dot represents a unique startup: the red dots represent startups acquired by a Canadian company, the blue dots, those acquired by an American company.

As seen in Figure 9, within the dataset, startups acquired by an American company tend to raise more funding and undertake a greater number of fundraising deals prior to being acquired. They also tend to hold more patent filings with CIPO and the USPTO at the time of acquisition and undergo larger M&A deals. The difference between the two groups of startups is less stark when looking the number of jurisdictions with trademark filings at the time of acquisition and the amount of non-repayable government funding received. Nonetheless, of the eight startups that received more than $500,000 in non-repayable government funding, just two were acquired by a Canadian company.

163 A chi-squared test suggested that the patent-filing relationship was statistically significant (p=0.007), though the trademark-filing relationship was not (p=0.165). These figures exclude the North Inc. / Thalmic Labs acquisition as this company held at least 323 patents with the USPTO at the time of sale, making it a significant outlier.

164 Nancy Gallini and Hollis, A., "To Sell or Scale Up: Canada's Patent Strategy in a Knowledge Economy," August 2019, IRPP, https://irpp.org/wp-content/uploads/2019/08/To-Sell-Or-Scale-Up-Canadas-Patent-Strategy-in-a-Knowledge-Economy.pdf

165 Much of the public funding that goes into AI R&D is not publicly reported, meaning these figures provide only a small window into the larger picture. Based on a sample of 126 Canadian AI startups that were either acquired or bought out at the time of exit. Dataset compiled using USPTO and Pitchbook data.

Domestically acquired Canadian AI startups received an average of $352,046 in non-repayable grants and contributions, while those acquired by an American company received on average $633,196. Based on a sample of 44 Canadian AI startups that received government funding and were either acquired or bought out at the time of exit. Does not include provincial/territorial level funding or public funding data that is not publicly accessible, such as the Scientific Research and Experimental Development (SR&ED) tax credit program (Canada's single largest program for R&D support). Dataset compiled using Government of Canada data and Pitchbook data. For Government of Canada data see: "Search Grants and Contributions," 2021, Government of Canada, https://search.open.canada.ca/en/gc/

Figure 9: The characteristics of 126 Canadian AI startups. Each dot represents a unique startup: startups acquired by a Canadian company are shown in red and startups acquired by an American company are shown in blue.

Government Financing and Innovation Infrastructure in Canada

While interviewees felt that scale-up capital was not readily available in Canada, nor (for some) adequate seed funding, many interviewees mentioned being helped by government grants and incentives.

Some well-known public grants serve only Canadian organizations, while others are available to both Canadians and FMNEs with activity in Canada. Government funding can play an essential role in helping very early-stage companies transform their IP into a prototype and prove their technologies. Many interviewees recall government funding and innovation infrastructure being a transformative stopgap in their early years—if they were able to access it. Later stage companies and FMNEs found tax credits and subsidies to be an important incentive for running operations in Canada. Companies in the middle of scaling faced a familiar problem discussed elsewhere in this paper: governments can help provide seed funding for a company, but mid-sized companies concerned with growth and valuation may not yet be in the position to fully capitalize on tax incentives if they are dedicating resources to securing further funding rounds.

The following federal innovation programs were raised by interviewees:

The **National Research Council of Canada Industrial Research Assistance Program** (**NRC IRAP**) provides programs and funding for Canadian SMEs. Canadian companies attempting to scale commented that:

- NRC IRAP only supports novel technology, such that IP is a critical component of attracting funding
- Given this mandate, one interviewee found NRC IRAP to be a more effective partner for emerging technology and pre-revenue companies than other government programs. They experienced NRC IRAP as a collaborative agency that gave essential help for developing a prototype, where other granting agencies would not work with unproven technologies

The **Scientific Research and Experimental Development** (**SR&ED**) **Program** "uses tax incentives to encourage Canadian businesses of all sizes and in all sectors to conduct research and development (R&D) in Canada."[166] It provides a higher subsidy amount to Canadian Controlled Private Corporations (CCPCs) than to other companies with activities in Canada.

> *"I remember I had one client who went bankrupt, leaving us with $200,000 of bad debt. I remember getting a check for maybe $400,000 in SR&Eds, which for us was transformational."*
>
> – Medical technology CEO, Canada

166 "Scientific research and experimental development tax incentive – Overview," March 31, 2020, Government of Canada, https://www.canada.ca/en/revenue-agency/services/scientific-research-experimental-development-tax-incentive-program/overview.html

Canadian companies and foreign investors alike accessed SR&ED incentives.

- Early-stage Canadian companies noted that programs like NRC IRAP, SR&ED funded early-stage R&D but required "legitimate risk"; holding formal IP helped a company make the case that they were a legitimate risk for funding
- FMNEs and several third-party experts mentioned that SR&EDs were critical to FDI attraction

However, some stakeholders saw gaps in SR&ED's offerings, particularly around requirements for commercialization. Notably, the SR&ED tax credit program is agnostic to IP commercialization and business scale up. Companies that conduct qualifying research with no intention to apply that research commercially receive the same financial benefit as companies that further invest in bringing their research to market (e.g., building prototypes, conducting user or quality assurance testing, developing branding and marketing materials, performing market research, etc.). Companies are also unable to claim IP costs associated with the R&D. This sentiment was reflected by some interviewees:

> *The issue with SR&ED is that it's supposed to promote productization and commercialization of IP. But it doesn't do that because there is no incentive to commercialize or productize. You have two kinds of companies applying to this: you can do research, but you never turn that into a product, or you have companies that turn their IP into revenue. The problem is that both of those companies get the exact same amount of funding whether or not they do the second part. We don't give companies any money back for taking those ideas and turning them into a product—these activities are different: they are a marketing plan, obtaining patent rights, commercializing things—there's no credits for this activity currently.*
>
> – Subject matter expert, law

Similar comments have been made publicly by innovation stakeholders:

> *Let's say you've been given a SR&ED claim of $1 million to ... do some research and development that potentially could create IP. You're not actually able to include that cost to create an IP patent in the application. In essence, what the government is doing is they're funding research and development, but they're not actually putting the net around it in order for the investments to actually be properly protected.*
>
> – Benjamin Bergen, Executive Director, Canadian Council of Innovators[167]

167 Jesse Cnockaert, "Talent is the jet fuel to get companies to grow and scale': attracting foreign talent and IP protection critical for Canada's innovation economy, says CCI," October 2021, The Hill Times, https://www.hilltimes.com/2021/10/25/talent-is-the-jet-fuel-to-get-companies-to-grow-and-scale-attracting-foreign-talent-and-ip-protection-critical-for-canadas-innovation-economy-says-cci/323378

> *What is needed is to get more SMEs engaged with CIPO and understanding that if they do not protect their intellectual property or brand, they will fail, and competitors will exploit their IP. I would recommend a grant program for patents and trademarks through IRAP as this will encourage SMEs led by entrepreneurs to protect their innovations.*
>
> – Suhayya Abu-Hakima, Innovator, Inventor, and Entrepreneur[168]

The **Business Development Bank of Canada** is a publicly funded venture capital organization that provides financing and advisory services. In addition, several interviewees mentioned **Sustainable Development Technology Canada** (**SDTC**), a similar organization that operates under the Innovation, Science, and Economic Development Canada (ISED) and focuses on clean technologies. One Canadian pre-revenue company found these organizations challenging to work with because they were not able to secure financing as a pre-revenue company and their IP knowledge was found lacking:

> *SIF and the SDTC looked at our IP, and the conclusion of their due diligence was that they didn't have the in-house expertise to understand what we were doing. If you're investing in new IP, asking us to be innovative, but at the same time have a TRL (technology readiness level) of 6 or 7, it doesn't match, there's a contradiction there.*
>
> – CEO, clean technology sector Canada

While these comments only came from one interviewee, numerous study participants discussed the trend that inadequate funding for proving technologies may result in early exits and acquisitions of Canadian IP that would otherwise be commercialized.

Other new/emerging technology interviewees had also encountered problems accessing tax credits or public financing. Though their comments did not refer to a specific program, they suggested that not everyone "fully understands" the technologies coming through review. They were also cautious about disclosing their IP in government applications because they found governments to be "extremely leaky, even when they sign non-disclosure agreements."

168 See: Suhayya Abu-Hakima, "innovation nation equals entrepreneurship nation: a story from a successful entrepreneur," October 2021, *The Hill Times*, https://www.hilltimes.com/2021/10/25/innovation-nation-equals-entrepreneurship-nation-a-story-from-a-successful-entrepreneur/323419

Another interviewee who had participated in multiple funding programs noted that R&D support programs approach Canadian IP ownership very differently. While the SR&ED program has no provisions specifically related to IP ownership and retention, programs like the SIF and Innovation Superclusters Initiative do (however, the associated scope and enforcement mechanisms vary). For example, Scale AI's IP strategy asserts that "it is core to the supercluster's mission that IP generated through projects primarily benefits the Canadian economy and not those of other countries."[169] Yet, when it comes to IP ownership, neither the government nor Scale AI own any of the IP and "project members have complete flexibility to decide who will own the IP created in their projects."[170] Meanwhile, the SIF program has very direct measures related to IP ownership. Companies that have received a loan through the SIF program must obtain ministerial approval before pursuing a change in ownership (which would occur, for example, in the event of an M&A). Otherwise, the company is liable for penalties of up to 300% of the disbursed loan.[171] While the long-term impacts of this kind of mechanism are not yet clear, there is potential for the resulting impact to be limited in scope. For example, the mechanism could end up only impacting the type of company that applies to a given funding program without addressing any of the challenges that deter IP retention in the first place. **Table 4** below provides an overview of federal innovation funding available in Canada over $500,000. It expands beyond the programs discussed by interviewees and breaks each program down by (a) purpose of funding, (b) availability to FMNEs operating in Canada, and (c) focus on IP as an output.

169 Other papers have noted that this public funding repayment model is in use in Israel at a larger scale: "Israel requires that foreign firms that purchase domestic businesses and have received public subsidies must maintain investment and employment in the country or repay a portion of the past subsidies." See: Robert Asselin and Sean Speer, "A New North Star: Canadian Competitiveness in an Intangibles Economy," April 2019, Public Policy Forum, https://ppforum.ca/wp-content/uploads/2019/04/PPF-NewNorthStar-EN4.pdf

170 Accessed August 12, 2021,"Business Benefits Finder," August 30, 2021, *Government of Canada*, https://innovation.ised-isde.canada.ca/innovation/s/?language=en_CA

What programs are not included in this list? R&D programs, such as those administered by NSERC and the NRC, that provide funding for R&D to academic institutions who then partner with private sector companies. The federal Innovation Superclusters Initiative, which provides funding for R&D, but the funding is technically provided by five independent, not-for-profit entities, each with an industry-led board of directors.

171 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, *OECD*, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

		Can the funding be used to...						Is the funding available to FMNEs in Canada?	Does the funding mention IP as key output?
		Start or buy a business	Hire, buy equipment?	Conduct R&D?	Increase working capital?	Grow and expand?	Sell globally?		
TIER 1	**BDC Small Business Financing** $1M max	✓	✓			✓		...	No
	BDC WIT Venture Fund (Seed) $1M max	✓	✓	✓			✓	...	
	SR&ED Tax Incentive Program $1.05M max			✓				Yes at a lower rate	Yes
	Innovative Solutions Canada $1.15M max			✓			✓	Yes but restricted	Yes
TIER 2	**IRAP by NRC** $10M max			✓		✓		Yes but only SMEs	Yes
	BDC WIT Venture Fund (Growth) $10M max	✓	✓	✓			✓	...	No
	Export Programs by EDC $10M max			✓	✓	✓	✓	Yes	No
	SIF Program $10M max			✓				Yes but restricted	Yes
TIER 3	**FinDev Canada Financing** $20M max			✓		✓	✓	Yes	No
	BDC Business Transition Program No max	✓						...	Yes
	BDC Buying a Business Loan No max	✓		✓		✓		...	Yes
	BDC Real Estate, Equipment No max		✓	✓				...	No
	BDC Working Capital Loan No max		✓	✓	✓		✓	...	Yes
	BDC Technology Financing No max		✓	✓		✓		...	No
	BDC IP-Backed Financing No max	✓	✓			✓		...	Yes

Table 4: Includes funding programs over $500,000 that exist at the federal level, are not province or sector specific, and are listed in the business grants and financing search tool.[172] The shading relates to the amount of funding available: the lightest shade corresponds to the Tier 1 level of financing discussed in the section on private investment. The medium shade corresponds to Tier 2, while the darkest shade corresponds to Tier 3.

172 Accessed August 12, 2021,"Business Benefits Finder," August 30, 2021, Government of Canada, https://innovation.ised-isde.canada.ca/innovation/s/?language=en_CA

What programs are not included in this list? R&D programs, such as those administered by NSERC and the NRC, that provide funding for R&D to academic institutions who then partner with private sector companies. The federal Innovation Superclusters Initiative, which provides funding for R&D, but the funding is technically provided by five independent, not-for-profit entities, each with an industry-led board of directors.

The weight given to Canadian Controlled Public Corporations versus Canadian subsidiaries of foreign multinationals differs across the various funding programs. For example, the Innovation Superclusters Initiative makes no differentiation between Canadian subsidiaries of foreign multinationals and CCPCs, nor do the various R&D programs administered by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the NRCC. Alternatively, the SR&ED tax credit program provides specific benefits to each type of company: namely, a 15% tax credit to foreign subsidiaries versus a 35% tax credit to CCPCs. Importantly, how we define Canadian companies and the way we consider different types of Canadian companies in our publicly funded R&D programs matters, especially given the borderless nature of IP.

Canadian R&D Subsidy Programs as FDI Attraction: Research Talent in Universities, Startups, and the IP Retention Question

> *The big attraction point for us right now is the innovation economy. Where the crux of R&D and IP creation comes into our wheelhouse is when we talk about talent, building teams, leveraging R&D tax credits, or working directly with the university on a project that involves some layer of in-depth research and creation of IP. So is IP the key driver? No, but it's always on the periphery of the projects we work on.*
>
> – FDI attraction specialist, Canada

Canada's R&D funding offerings are frequently used by FDI attraction agencies to attract greenfield investment to Canada. Two interviewees working in FDI attraction noted that they had significant success with R&D shops, and aimed to "attract that IP, retain the IP, and commercialize tangible assets abroad." R&D shops were attractive to investor interviewees both because of subsidies such as SR&ED and because of the talent available in Canada—partnerships with Canadian universities and other research organizations were seen as highly appealing. Certain industries have seen a decrease in R&D productivity in recent years, and many firms are addressing this challenge by outsourcing and lowering the cost of R&D through acquisitions and partnerships with startups and universities.[173]

173 Cadestin, C. et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

Universities and university IP commercialization offices may play a role in setting up partnerships between researchers and FMNEs, or they may support the researcher to license a patent or create a startup. Such offices exist in institutions across Canada, and many of them include a creator-owned IP policy with a royalty due to the office upon commercialization (one interviewee estimated 20% as a common fee, while another noted that this negatively impacted companies in VC funding rounds). Notably, federally funded academic research programs, such as NSERC and the Canada Research Chairs program, default to partner institutions' resident IP policies, and Canada's academic landscape consists of widely varied approaches. One IP commercialization office noted that most researchers opted to license their IP to a pre-established company rather than create a startup due to risk aversion and lack of experience, and that the company they licensed to was often a FMNE that retained the IP in the end.

To support a researcher establishing a startup, the IP commercialization office connects them with accelerators and funding proposals, de-risks the technology by staying with the company until it prototypes, taking the prototype to investors and customers, and pairs them with more seasoned entrepreneurs when possible. After crafting the company plan and filing articles of incorporation, the IP office pulls out after the startup has their first VC round. Despite this work, the IP commercialization office still sees the vast majority of companies driven to acquisition by VCs and board members. At a different university, one Canadian company was told not to liaise with their IP offices' services because "they drag on negotiations, ask for too much—they kill deals and kill companies." It is clear that many university IP commercialization offices already do play a significant supporting role for new Canadian companies, and different offices have different reputations. Future research could investigate the optimal role for university liaison offices and IP commercialization offices in ensuring that the companies emerging from their schools have strong opportunities as they scale.

Accelerators, incubators, and not-for-profit research institutes also play a role in FDI attraction via R&D partnerships. In addition to fostering Canadian companies, organizations like these may broker connections with FMNEs for small companies, or form partnerships themselves. FDI attraction specialists might use organizations like the Vector Institute as additional incentives to draw foreign companies to Canadian cities, as such organizations can be home to prestigious talent. Furthermore, these organizations often attract federal or provincial R&D incentives similar to their peers in universities. Accelerators, meanwhile, play an important role in helping their participating companies source first buyers and investors who are often outside of Canada. One accelerator running internationally discussed their practice of introducing Canadian companies to American university research teams, introducing opportunities for R&D partnerships wherein a Canadian company could obtain the rights to IP developed abroad.

Some interviewees felt that R&D collaborations between a FMNE and a university or accelerator resulted in an exodus of Canadian IP in the sense that FMNEs often retain the rights to any IP generated through such partnerships.

> *Universities are strapped for funding. A company comes in and offers lab equipment and training, and it has generally not seemed like a bad deal to sign over IP in exchange for all those benefits. Universities and researchers are not interested in commercializing and developing businesses out of the IP. But there's a real trade off from the economic perspective of business in this country.*
>
> – Professor, subject matter expert

This perspective stands in stark contrast to the interviewees who felt that FDI was "attracting and retaining IP" from FMNEs doing research in Canada. These two claims form an undeniable tension that underlies the topic of the relationship between FDI and IP. All told, interviews suggest that there are a wide variety of FDI R&D arrangements: partnerships that result in IP extraction are not the full story, but nor should their existence be dismissed. Similarly, trade-offs and alternatives must be considered as a part of this discussion.

Accordingly, several questions emerged from interviews to bring some nuance to the debate between IP extraction and FDI attraction:

When a FMNE attracts R&D funding in Canada, alone or in partnership, what parties keep the rights to the IP emerging from the R&D?

Often, FMNEs are providing R&D funding, market access, and other resources in exchange for IP and talent. However, there are some examples of FMNEs that leave IP in the hands of universities and researchers. One major investor described a research arrangement where they funded a scholar's work, the scholar retained the formal IP protecting their solution, and the FMNE retained a first-to-market privilege. However, the same interviewee noted that their policy was the exception, not the rule. Another commented that IP negotiations were left to their international HQ, not the Canadian subsidiary, but that IP agreements typically depended on how much of a project was co-developed. In situations where they were helping a researcher or startup fine-tune their product for business use, the researcher likely kept the IP. For projects where both parties contributed to the R&D, the FMNE was likely to try to retain the IP.

The question of IP retention extends past R&D collaborations to acquisitions and greenfield FDI. Some respondents suggested that FDI attraction packages could include more caveats that allow Canadians to use the IP:

> *We've always perceived companies coming in and creating jobs as a huge benefit to Canada. There's every advantage to wanting this to occur. So if [a tech business] comes in and hires people, they become skilled. Of course hopefully they move on and maybe start their own businesses in Canada. But is there return on that IP for Canadians? And that's the piece that isn't included in these packages generally: is [there] either freedom to operate for Canadian companies using IP that's generated out of the [tech company campus] or returns from IP specifically, not just out of the jobs and factory created. To me, that's the missing piece.*
>
> – Professor, subject matter expert

When, where, and how is IP commercialized?

IP may be developed by Canadian universities but owned by a FMNE in an exchange that involves long-term benefits to Canada such as a new research lab, new jobs, and prestige. Conversely, many interviewees contended that digital economy investment did not generate the same commercial value as traditional, brick-and-mortar R&D. For example, a research team founded by a FMNE may only create 10 new jobs in Canada, while the corporate tax benefits from the IP created in that lab are realized in another country. Alternatively, tax benefits may continue to go to Canada if the IP and staff exist within a Canadian subsidiary with specific tax planning. All told, corporate registration and tax planning are highly complex considerations beyond the scope of this paper. Nevertheless, it is important to carefully weigh the relative value of potential jobs—including their potential spillover effects, if Canadians are trained well and then able to stay in Canada—versus potential revenue from IP in any transfer of IP ownership or R&D agreement.

As discussed earlier, Canadian startups may be acquisition driven, resulting in early transfers of their IP portfolio to international acquirers, and this topic is similarly complex. Canadian IP may be transferred to a FMNE at a reasonable price that allows the researcher to reinvest in their work or a new company. Alternatively, IP may be transferred early: if a Canadian researcher cannot find seed funding (or is not interested in entrepreneurship), they might sell their IP at a much lower price than it would earn as a prototype or proven technology.

At the heart of this debate is whether IP retained domestically stimulates greater long-term growth than IP transferred to foreign parties operating in Canada. Interestingly, one study examines the relative value of foreign and domestic innovation for per capita GDP growth from 1970 to 1990, finding that foreign innovation (measured by high technology imports to a home country) stimulates higher GDP growth than domestic innovation (measured by that home country's USPTO patent registrations) across the OECD, with the exception of the United States.[174] While this suggests that there are many ways to create wealth other than IP retention, the first proxy (high technology imports to an OECD country from abroad) is not identical to the question at hand, and the economies in question have changed significantly since that research was undertaken. For the purposes of this study, it would be more fruitful to assess the GDP impact of IP created in Canada but commercialized by a foreign entity with operations in Canada, versus IP held by CCPCs. Each may depend not solely on the inherent value of the IP but also on a company's market access and capacity to commercialize it. Accordingly, another important question is:

How prepared are Canadian researchers and startups to meaningfully commercialize their IP?

A researcher with knowledge of IP and its value at different stages of development may be better equipped to negotiate a stronger deal. Programs like the Innovation Asset Collective aim to assist with researchers' IP literacy and better equip them to sell their work at an advantageous price. Similarly, programs like the CTA offer IP literacy training to Canadian companies developing networks of investors and clients in the United States. Nevertheless, many interviewees still see a gap in IP literacy for small companies and possibly an even bigger gap for university researchers:

> *"They for sure don't teach it in engineering. People don't understand IP, they don't understand what they own or how to own it. It's also the people who are creating–there's a collaboration aspect. They don't want to keep it to themselves. They want to share their output and say, 'Hey, look what I did.'"*
>
> – CEO Advisor

IP literacy extends beyond learning when to protect IP or file for a patent. To appropriately commercialize IP, interviewees noted that it was essential to have a strategy to deal with potential competition. One interviewee commented on cellphones as an example of an industry where "things are moving so quickly that you can't properly protect your IP" such that speed to market is an essential consideration in tech.

174 Patricia Higino Schneider, "International Trade, Economic Growth and Intellectual Property Rights: A Panel Data Study of Developed and Developing Countries," *Journal of Development Economics* 78, no. 2 (December 1, 2005): 529–47, https://doi.org/10.1016/j.jdeveco.2004.09.001.

Accordingly, a startup or researcher who protects their IP legally but is not first to market might also not fully commercialize their work. Even legally protected IP is hard for small organizations to defend if a larger company (with far more legal resources) discovers and uses it. This goes double for Canadian companies attempting to commercialize their IP internationally, with interviewees in FMNEs voicing doubt that most startups knew how to protect and license their products effectively.

Other interviewees reinforced this impression by contending that the Canadian conversation on IP stopped with universities and filing, teaching researchers little to nothing about business commercialization. One of these respondents listed missing considerations in IP literacy training for new market entrants:

> *How to operationalize patents and inventions, how people flow, how mobility of labour, goods, licences, and ultimately profits, and how that works with things like international tax requirements, transfer pricing, and the role that IP plays in understanding where your assets, activities, risks, decision-making, investment opportunities are. If you start thinking about those parts of the continuum, that's where you get the growth, scale up, and ultimately economic benefits to where the geopolitical host of the investment is.*
>
> – CFO, life sciences sector, Canada

Another referred to the role of acquisitions in circumstances where researchers protect IP but do little to commercialize it:

> *Many technologists and engineers think if you build it, they will come, and there are no people coming. You might have really great IP protection, but if you just stay in the back room and don't do work with your business, either you're lucky and somebody scoops you up or you just go to nothing. I know that Canada is always looking at how do we increase IP residing in Canada? But I think what's missing is 'how do we commercialize that IP really?*
>
> – CEO, AI sector, Canada

An Expert Panel on Intellectual Property was assembled by the Ontario Government in 2019 to assess the scope of these challenges in Ontario. A key recommendation by the panel was to establish "a centralized provincial resource to provide consistent, sophisticated legal and IP expertise and education." [175] The recommendation would establish a centralized resource for IP and commercialization expertise, in turn bringing Ontario closer in line with Québec and other innovation economies globally.[176]

Without support from an MNE, what parties would purchase or scale Canadian IP?

One interviewee coming from the perspective of an accelerator felt that R&D partnerships with foreign FMNEs were essential to move Canadian solutions toward market readiness and expanded market opportunities. Nearly all interviewees conceded that in the absence of FMNE partnerships, there are not enough large investors or first buyers in Canada to scale most new technology companies. An early publication on this topic highlights an important consideration about the acquisition of Canadian IP: the "problem" with foreign acquisitions may be "less about foreigners absconding with Canadian IP than with domestic difficulties bringing innovative ideas to market."[177]

Interestingly, this issue comes back to the previously discussed dearth of private investment in Canada, and the small market size. Rather than being able to scale effectively here, Canadian companies are acquisition driven.

> *In my opinion, it comes back to money. For Canadian businesses where monetizing IP is their game plan, they're going to have less resourcing than an equivalent company in the United States and maybe in Europe.*
>
> – CEO, technology services, Canada

Along these lines, some interviewees suggested that government had a role to play in keeping publicly funded IP in Canada through strategies such as purchasing the outputs of Canadian research or otherwise create systems wherein publicly funded researchers had to keep their IP in Canada:

> *If our policymakers don't understand the importance of having our own researchers–who were paid with public money, having patents and retaining them in Canada–this is how we lose the innovation race.*
>
> – Research institute, Canada

175 "Intellectual Property in Ontario's Innovation Ecosystem: Expert Panel on Intellectual Property," February 2020, Queen's Printer for Ontario, https://www.ontario.ca/document/report-intellectual-property-in-ontarios-innovation-ecosystem

176 Including the Fraunhofer-Gesellschaft in Germany, Korean Institute for the Advancement of Technology in South Korea, Israel Tech Transfer Network in Israel, and A*ccelerate, the commercialisation arm of the Agency for Science, Technology and Research (A*STAR) in Singapore.

177 Karen Mazurkewich, "Rights and Rents: Why Canada must harness its intellectual property resources", 2011, Canadian International Council.

Examples of government involvement in IP commercialization exist internationally. In Germany, the quasi-public Fraunhofer-Gesellschaft governs commercial research exploitation: its 74 research institutes work closely with more than 180 German universities and industry partners on seven strategic research areas, including AI, next generation computing, and quantum technologies. Fraunhofer's standard IP agreement is that, so long as a researcher uses Fraunhofer resources, Fraunhofer will own the IP. For more complex partnerships, Fraunhofer will identify each party's contribution and ensure "equivalent royalty payments upon successful commercialization."[178] These strategic IP agreements help enable the Fraunhofer to generate a three-fold return for the public purse.[179]

Other interviewees noted that one of the reasons why FMNEs may purchase Canadian IP and then scale it in other places is that Canada is not an easy country in which to scale, for all of the reasons already described in this paper. This frames the issue again as one of incentive structures: why should Canadian companies or FMNEs choose to remain in Canada if growing their company will be an uphill battle? One interviewee noted that patent boxes might help with this problem:

> *"No one at a multinational company has ever said that Canada is a good place to scale a company. They might say that Canada is a good place to do R&D because they have good tax credits. But they have never said Canada is a good place to scale up, make infrastructure investments, build factories, grow our working capital and our staff around operations, and grow a company."*
>
> – Life sciences MNE, originally from Canada

What goals and side effects of FDI/University partnerships are there to consider other than IP?

Interviewees in this study were more interested in IP commercialization than open data, academic publications, and open-source tools. However, some noted that R&D partnerships were sometimes related to open academic competitions and resulted in new data science communities, publications, or open solutions for public good. Alternatively, as discussed above, universities may be weighing new buildings, equipment, and training against the value of IP.

In addition, university researchers may benefit from partnerships with companies that offer entrepreneurial expertise or assistance developing prototypes and a business plan. One foreign direct investor noted that they "see a large gap between fundamental and applied research," and their R&D work was primarily geared toward prototyping.

178 Catherine Jewell, "Forging the future the Fraunhofer way," April 2017, *WIPO Magazine*, https://www.wipo.int/wipo_magazine/en/2017/02/article_0002.html

179 Rainer Frietsch et al., "CONTRIBUTION TO THE GERMAN INNOVATION SYSTEM – FRAUNHOFER-GESELLSCHAFT," 2018, *Fraunhofer-Gesellschaft*, https://www.fraunhofer.de/content/dam/zv/en/research/Range_of_Services/Fraunhofer-ISI-Impact-Study-Summary.pdf

Finally, a policy-oriented interviewee commented that ties between public organizations, academia, and business might have "more of a hard international relations goal, improving relationships among countries rather than enabling companies to flourish and emerge."

What countries are we competing with to attract FDI, and how do our incentive structures compare?

Some interviews suggested tying R&D funding, such as SR&ED, to IP requirements, such as a requirement that IP developed in Canada under SR&ED must not be transferred to a foreign entity without returning the grant funding. Simultaneously, numerous interviewees commented that any changes to R&D funding structures might result in less business activity in Canada, or indeed that Canada already paled in comparison to competing nations. The problem of competing incentive structures appeared somewhat unsurmountable for many interviewees, regardless of their position on FDI.

This was true for both domestic projects in Canada considering moving abroad for more favourable tax policies, and for FMNEs:

> *We've taken advantage of IRAP and Natural Resources Canada laboratories and programs. We have won several grants to do larger projects here, but we've yet to take any of that money because there's only so many of these big projects you can do, and the difference is we could get 30% to 50% government funding here, meanwhile in Europe, we can get 70% to 80% of projects funded. And, in fact, the project we're doing in Norway is over 90% funded by statecraft, without dilution, without any of our equity going out the door. When we get a grant in Europe, we get the first 20% of the grant up front in cash so we have working capital. In Canada, you have to wait till you spend your money, then submit, and then get some portion of that money back and it's only 30% to 50%. And then you have a 10% hold back on the costs to get a grant as opposed to Europe. That's just such a simple change.*

In sum, this poses the question, is it contradictory to support Canadian IP development, retention, and commercialization while keeping Canada an attractive place to do business for international players?

Both Canadian companies and international companies interact with government financing and innovation infrastructure. Changes to government programs will impact both of these players: accordingly, any discussion of FDI policy needs to be holistic. Changes to FDI policy must acknowledge that FDI attraction subsidies impact both FMNEs and Canadian businesses, who access the same programs, on their own or through partnerships, or who indirectly benefit through procurement and B2B deals.

Many third-party expert interviewees had understandably strong perspectives on this issue given their roles as either FDI attraction representatives or IP literacy and retention advocates. However, many also pointed out that both IP commercialization and FDI attraction are essential to the Canadian economy. SR&ED incentives and Canadian university talent are unquestionably a significant component of FDI attraction. Many interviewees suggested that making changes to SR&ED credits would have a detrimental impact on FDI inflows, as other countries compete for FDI and may have more competitive arrangements. Simultaneously, Canadian university talent can be better supported to understand the importance of IP, particularly in stages beyond registration or publication. In addition, the SR&ED, NRC IRAP program, and others, can provide the necessary funding to help Canadian researchers move their company from IP to prototype to market-ready solution, giving them more leverage when negotiating a sale or a funding agreement. As one Canadian company articulated, "You need a strong value proposition for investors to come in, and that includes the government."

This paper contends that both Canadian innovators and FDI in Canada can be supported via a strengthened Canadian innovation ecosystem, with attention to business density, entrepreneurial experience, improved access to capital, and better IP commercialization literacy for Canadian researchers. The following section presents a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the Canadian innovation ecosystem with these goals in mind, pulling together key findings from throughout this paper.

Conclusion and SWOT Analysis

Canada's innovation ecosystem includes many players: entrepreneurs, domestic and multinational businesses, universities, investors, government funders and regulators, and accelerators. At the micro level, each of these players acts according to environmental stimuli (some which they have in common, and some which are unique to certain stakeholders or industries), but in aggregate, their actions spur impactful trends in Canada's innovation ecosystem:

- Canadian businesses often look abroad for investment when fundraising and for customers and clients while scaling. They also tend to file their IP in the U.S. instead of Canada, and sometimes move sales or business development activities to the U.S. or source executive talent from the U.S. Because of these strong international ties, businesses that are focused on scaling may also forge strategic partnerships with foreign investors or international first buyers to help them scale, access broader markets, and gain business experience.

- Scaling a business is not an easy task, and not all entrepreneurs or inventors see this as their end goal. In response to the challenges associated with starting and/or scaling a business, Canadian inventors often choose to sell or transfer their IP at an early stage rather than building and scaling a business. Similarly, in response to these challenges, some business founders become highly acquisition driven. Familiarity with IP commercialization, entrepreneurship, and scaling experience also impacts these trends.

- Canada has the most highly educated workforce in the world (according to OECD data[180]) and key talent often costs less here than in the U.S. There are also a wealth of government fundings programs for R&D, alongside a sophisticated ecosystem of post-secondary institutions. Finally, Canada offers political stability and quality of life located close to the United States. Responding to these and other incentives, foreign investors make Canada part of their global footprint.

180 "Adult Education Level (Tertiary Education)," Accessed January 18th, 2022, OECD, https://data.oecd.org/eduatt/adult-education-level.htm

When strategic companies (some with IP holdings) become available at a reasonable cost, foreign investors are likely to buy them. Foreign investors may retain these companies in Canada as subsidiaries or move them abroad. Similarly, senior talent leaving an acquired company take many paths: some become founders, some move to other FMNEs or other countries, and others still return to the local startup ecosystem, working with and for peers.

Some of these trends lead third-party experts, including interviewees in this study, to question whether FDI attraction and domestic IP development, commercialization, and retention can exist harmoniously; and further, whether FDI negatively impacts the ability of Canadian businesses to develop, retain, and commercialize their IP. Yet a holistic approach to answering these questions finds that many entrepreneurs, investors, and other stakeholders feel that both FDI attraction and IP commercialization are essential to their work and the Canadian economy. Further, the individual experiences of players in Canada's innovation ecosystem are often unique: this paper contains numerous examples of Canadian companies and foreign investors that took diverse paths when scaling, selling, or investing in Canada. The reality is that FDI's impact on IP and innovation varies substantially by technology subsector and is heavily influenced by:

- IP density and the type of IP relevant to the subsector
- The subsector's absorptive capacity (which is in turn influenced by business density and the strength of local innovation networks)
- The availability of domestic funding and the subsector's scaling needs

At the same time, this study finds that there are clear challenges in Canada's innovation ecosystem that need to be addressed: Canadian startups may be forced into early exit planning by investors; there is high competition in some cities for Canadian tech talent; and there are few Canadian companies able to acquire and scale startups in technology subsectors, such that exiting startups typically sell to a foreign buyer and senior talent, IP, and exit capital may or may not remain in Canada. These challenges also influence the absorptive capacity of local technology subsectors (that is, how well they can absorb intangible capital and other positive spillovers from FDI).[181] Policies that aim to strengthen domestic innovation while connecting local businesses to the global economy can help Canadian business grow their intangible capital and benefit from FDI. Supporting companies to invent, scale, and reinvest in Canada is of prime importance for both Canadian business density and FMNEs operating in Canada, and there are opportunities in both domestic innovation policy and FDI attraction policy to foster a healthy and diverse business ecosystem. Accordingly, the Canadian innovation ecosystem's strengths, weaknesses, opportunities, and threats in light of FDI and IP are summarized below.

181 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, OECD, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

Strengths

- Canada is home to strong talent, world class post-secondary education institutions, academic rigour, and a high quality of university research infrastructure and funding. This is paired with lower labour costs relative to the U.S., making Canada an attractive destination for individuals and FMNEs.

- Canada is a top destination for highly skilled immigrants and international remote workers. The Canadian immigration process is, for some, easier and more reliable than that of the U.S., and Canada has strong labour mobility provisions in treaties such as CETA. Similarly, Canada has relatively strong political and financial stability.

- A high quality of life exists across Canada, though this is increasingly mediated by affordability issues in big cities like Vancouver or Toronto.

- Several Canadian sectors have strong international reputations, such as oil and gas, forestry, and health care.

- Canada offers several incentives that are well-liked by Canadian businesses and international companies that are considering Canada as a destination. These include SR&ED's offerings and IDTMC offerings in BC. Other innovative policies recognized were the patent box in Québec and the novel Innovation Asset Collective.

- There are abundant early-stage grants that Canadian companies can access to help them with seed funding and attracting further venture capital.

- Though Canada has a small market, it can sometimes act as an important test bed for new companies that then expand south, giving them a period with less competition to prove their technology. Canada offers a smaller ecosystem with intimate business connections and numerous partnerships.

Weaknesses

- Canada's small market reduces its attractiveness for market-seeking FDI: it also makes it challenging for Canadian startups to scale domestically.

- A dearth of entrepreneurial expertise, including poor IP literacy, inadequate IP programming in schools and industry events, makes Canadian innovators often focus more on registration and publication rather than commercialization.

- Poor capital availability limits the ability to scale. Along with the entrepreneurial brain drain and market access, this results in many Canadian companies being acquisition driven or moving abroad.

- Government grants sometimes fail with high technology proposals: some find government organizations to be "leaky" with IP and/or require outside expertise to properly evaluate certain proposals. This contributes to companies being slow to market with their IP, and/or protecting it poorly, opening up more chances for the innovation that their IP protects to be used by competition.

- There is a lack of competitiveness in key Canadian sectors, which are highly regulated and protected and sometimes involve powerful lobby groups (some companies in these ecosystems also positively benefit from procurement relationships). However, these industries can be more conservative in adopting new technologies.

- There is a low number of large Canadian tech companies (outside of telecommunications) that can act as mentors, funders, or acquirers for Canadian startups.

- Canadian VCs tend to be more conservative in their rate of return and timeline to exit, and may push companies to be "on the clock" to exit faster than VCs in the U.S. Similarly, they may focus more on valuation than product development, reinvestment, and R&D.

Opportunities

Opportunities for improving Canada as a place to scale technology companies

- Improve access to and understanding of international VCs among Canadian startups and scale-ups (a task made easier by COVID-19 and the increasing acceptability of virtual pitching). Encourage inbound foreign portfolio investment at later stages of a company's lifecycle so that a company is more likely to grow in Canada.

- Improve new companies' understanding of scale-up business model acceleration and securing clients and first buyers. Support companies to forge partnerships with FMNEs known to be supportive partners (in all interviews, stakeholders could easily identify businesses known to look for strategic acquisitions and those more likely to procure, partner, and mentor).

- Help Canadian businesses integrate into global value chains through FMNE procurement. This can be done through standards alignment and by ensuring local products and services are well suited to global value chains and FMNEs.

- Ensure local technology subsectors are well-equipped to benefit from FDI spillovers, such as the accumulation of intangible capital within FMNEs.[182] This can be achieved by increasing firm density, strengthening domestic innovation networks, improving business-to-business mentorship opportunities, and promoting business and IP literacy. Non-competes also limit the for R&D talent to apply spillover knowledge at new companies.

- On a micro level, entrepreneurs make decisions about where to start and grow their businesses based on a number of factors (such as patent boxes or direct tax credits). It is important to ensure that Canada's innovation ecosystem is competitive for entrepreneurs when compared with other countries, balanced by an understanding of the trade-offs of each policy.

Opportunities for improving IP literacy and commercialization in Canada.

- FMNEs are increasingly relying on outsourcing and partnerships to de-risk R&D. While this creates meaningful opportunities for Canadian businesses and researchers to engage with FMNEs, IP literacy is needed to ensure mutually beneficial partnerships. Organizations like CIPO have begun this work, but there are countless other venues where it can continue—for example, in computer engineering programs or other post-secondary programs related to ICT, and at industry events like conferences, trade shows, and hackathons.

- Legal fees associated with IP protection and commercialization are a known barrier for many startups and SMEs. The legal and innovation industry could support SMEs and startups by considering new models of billing and playing more of a role in education. Similarly, programs like accelerators and incubators can use new funding, such as that proposed in Budget 2021, to provide startups with access to expert IP services.[183]

- University IP offices, accelerators, and institutes have unique opportunities to support Canadian researchers, secure partnerships that promote IP retention and commercialization, and guide businesses to success. The royalties attached to the use of IP commercialization offices and resources was seen as detrimental to companies, and there may also be opportunities to improve the support given (e.g., by extending VC networks, securing more strategic IP positions for researchers).

- SR&ED credits comprise the largest R&D program in Canada and were well-liked by all interviewees as a way to attract R&D partnerships to Canada. However, some stakeholders saw gaps in SR&ED's offerings, particularly around requirements for R&D commercialization. Notably, the SR&ED tax credit program is agnostic to IP commercialization and business scale up.

182 Ibid.

183 "Budget 2021 A Recovery Plan for Jobs, Growth, and Resilience," 2021, Government of Canada, https://www.procu.gc.ca/2021/home-accueil-en.html

Companies that conduct qualifying research with no intention to apply that research commercially receive the same financial benefit as companies that further invest in bringing their research to market (e.g., building prototypes, conducting user or quality assurance testing, developing branding and marketing materials, performing market research, etc.). A focus on IP commercialization could further enhance the SR&ED program.

Opportunities for improving business density through FDI.

- Many greenfield investors voiced an interest in developing greater business density in their ecosystems. Similarly, research synthesized in this study highlights the importance of business density for backwards-vertical knowledge spillovers: FMNEs procure solutions from Canadian companies that can then expand to new markets and gain experience. Accordingly, encouraging foreign investors to procure from and mentor Canadian companies may enhance FDI's impact on Canadian business density. One interviewee noted that the automotive industry in the U.S. has at times offered small tax credits to FMNEs that staff mentors for technology companies who want to sell to them. To have the best impact, Canadian solutions in innovation-related industries should also take part in procurement relationships with MNEs, rather than just suppliers of natural resources.

- Bolster industry associations and other relationship-building organizations that work to improve salary parity in times of labour scarcity, reduce labour scarcity, and maintain fair competition within a jurisdiction.

- Further improve labour mobility to keep attracting technology and entrepreneurial experience to Canada and reverse the entrepreneurial brain drain.

Opportunities for future research and improvements to indicators.

- Assessing the composition of inward FDI is currently challenging using national data sources. Research such as suggested below would be facilitated by more granular FDI indicators for Canada, such as a breakdown that includes R&D as a primary motivator for FDI.

- Data is related to IP but is also a distinct issue with unique qualities. Data ownership and commercialization in Canada requires a different strategy and considerations than patents, trade secrets, or business knowledge, in part because data is gathered through platform economies and requires public access to devices and services. The relationship between data and FDI merits distinct treatment and its own study.

- Several interviewees and one external publication suggested that private investors react differently to different kinds of government support. For example, interviewees noted that while direct financial support is useful and appreciated, government procurement signals to investors that there is a market for the companies' products or services. Canada would benefit from further research on the downstream implications of government support.

- Similarly, several comments from interviewees suggest that Canada (and indeed, the investment world as a whole) would benefit from a GBA+ (gender-based analysis plus) focusing on power dynamics and interpersonal relationships in pitching and securing financing in technology and investment.

- Several interviewees suggested that FDI deals should include freedom for Canadian startups and SMEs to use any IP developed in Canada, even if transferred to the FNME. A feasibility study could be conducted to understand FNME perspectives on this, whether it would negatively impact inward FDI, and what parameters would be best (e.g., if all IP connected to a R&D tax credit was free to use among Canadian startups and SMEs for a set amount of time, would this be significantly detrimental to investment or not?)

- Governments should assess whether programs related to FDI and R&D use comprehensive, inclusive indicators for innovation success, and establish new indicators where needed. New indicators should go beyond traditional growth measures like GDP and job growth to account for things like IP and data, improvements to Canadians' quality of life, and equitable growth. FDI related programs should also assess the impact of FDI on business-to-business mentorship opportunities, global value chain integration, and talent development.

Threats

- A possible threat is the continued brain drain of senior talent, including the most entrepreneurially experienced. Today, due to the prevalence of remote work in knowledge-based industries, this threat exists even if talent does not physically leave Canada.

- Similarly, COVID-19 may create unexpected labour market trends, such as movement away from downtown cores, increased uptake of international remote work, or reduced international university enrolment that disrupts talent attraction.

- A lack of attention to IP may result in a limited portfolio of Canadian products and services that receive revenue. Return on investment for public R&D funding may be closely intertwined with economic sustainability, particularly as the importance of technology sector value grows.

- Conversely, too much IP protectionism could result in less FDI, and this would be bad for the Canadian economy—with all of the opportunities listed above, it is essential to adopt a balanced approach that addresses the composition of FDI and the benefits afforded to Canadian researchers and companies. This study has focused on the net benefits of FDI, but a second consideration is national security and freedom to operate for Canadian companies. For example, it may become a policy problem for Canada if companies have reduced access to core technology inputs (like components of phones or infrastructure) or IP. Similarly, Canada's ability to defend itself against international IP theft may need strengthening in the long term.

- Ultimately, business density is of a primary concern to Canada. If businesses continue to leave Canada as they succeed and scale, the country is less likely to see a strong innovation ecosystem with medium and large businesses that can act as mentors, funders, and acquirers. Similarly, low business density reduces Canada's attractiveness as a destination for market-seeking FDI and Canada's absorptive capacity for positive FDI spillovers.

- Interviewees in this study made it clear that choosing where to locate an office or headquarters is a highly strategic decision that is continuously reviewed and based on a number of constantly evolving factors (including the health of global and regional economies and how competitive tax systems are in foreign jurisdictions). FMNEs build redundancy into their global networks, operating in different countries to hedge risks and remain agile.[184] Uncertain environments like COVID-19, climate change, and changing tax system may cause FMNEs to divest from some locations. Low business density combined with an over-reliance on FMNEs may create risk for Canada's innovation ecosystem.

- Similarly, fiscal optimization strategies, such as using IP royalty payments to shift profit from high to low tax jurisdictions, are common among FMNEs, particularly in high technology industries.[185] If corporate tax revenues are regarded as one of the benefits of FDI, strategies that seek to reduce the amount of taxes paid are a risk. Canada should continue to work with international partners at the OECD to understand and curb tax avoidance by FMNEs.

184 Charles Cadestin et al., "Multinational Enterprises and Intangible Capital," September 2021, *OECD*, https://www.oecd-ilibrary.org/docserver/6827b3c9-en.pdf?expires=1638980831&id=id&accname=guest&checksum=93E94187D9DF056A46B871112556F471

185 Ibid.

Appendix

Methodology

This study investigates the relationship between inward FDI and IP development, retention, and commercialization in Canada. First, the authors of this study conducted a comprehensive literature review of existing findings on the relationship between IP and FDI, with a specific interest in Canada and the OECD, as well as literature and secondary data on IP registration in Canada, FDI in Canada, and Canadian policy discussions of the relationship between the two.

Interviews

Informed by the literature and secondary data review, the authors of this study conducted 43 semi-structured interviews with three groups of respondents:

- Canadian technology companies seeking FDI and/or developing IP strategies
- Foreign direct investors with interest in Canada or existing operations or acquisitions in Canada
- High-level subject matter experts in FDI and IP

Each interview was between 30 minutes and one hour long. The authors conducted a thematic analysis of interview transcripts to inform the final paper.

Additional Secondary Data and Case Studies

Informed by the interviews, the authors collected additional secondary data to attempt to test or illustrate claims made by interviewees. Furthermore, the authors compiled three case studies of technology subsectors to explore three different thematic areas, with different approaches as described below.

1 Talent in the biomedical devices and health technology industry

The medical devices and health technology case study was inspired by informal research that was conducted by Scott Phillips (CEO, StarFish Medical) in 2017.[186] While the research questions and methodology were tweaked slightly for this paper, ICTC's approach largely resembles that of Phillips. To answer the question, where does local, startup talent go following an acquisition? ICTC analyzed the movement of senior technical and executive talent following an acquisition. First, ICTC used Pitchbook to generate a list of Toronto-based startups that both operate within the medical device industry and had been acquired. ICTC used "medical devices" as a search term and to be included in the dataset, (1) the company's global headquarters had to be located in the GTA and (2) the company had to have undergone a qualifying M&A transaction. From here, ICTC used publicly available job sites to analyze local talent flows. To be included in the analysis, talent (1) had to be located in the GTA before and after the qualifying transaction, (2) have the acquired company publicly listed in their employment history, and (3) have held a senior position (e.g., at the manager, director, or executive level) at the time of acquisition and at their new company. For this portion of the case study, the data was accessed in August 2021.

Secondly, to answer the question, what is the professional background of local founders? ICTC studied the professional backgrounds of 272 individuals who were from the GTA and had founded a medical device company. To do this, ICTC collected publicly available data about company founders, including whether the individual had:

- worked at a Canadian company prior to founding their company
- worked at the Canadian subsidiary of a FMNE prior to founding their company
- obtained private sector experience prior to founding their company

Because ICTC chose to collect secondary data as opposed to conduct interviews or a survey, there is some risk that there are errors in the data. As such, the data should be interpreted as a rough estimate of the founders' professional backgrounds and not an exact depiction.

2 Carbon Capture, Utilization, and Storage/Private Investment

ICTC compiled a list of Canadian organizations in the CCUS innovation space. The list was compiled from ecosystem reports and other literature, interviewee insights, and patent analysis of Canadian organizations that hold CCUS-related IP in CIPO or USPTO. CMC Canada kindly provided secondary data advice, including several terms used to conduct patent searches. CCUS patent holders included Canadian universities, crown corporations, privately held and publicly held companies, and individuals unattached to companies.

186 Scott Phillips, "Current state of innovation in the Canadian medical device industry," July 8, 2017, *StarFish Medical*, https://starfishmedical.com/blog/current-state-of-innovation-in-the-canadian-medical-device-industry/

The list of CCUS innovators used in this case study includes:

- 12 companies that are publicly held or in IPO registration, primarily energy and oil and gas corporations that also conduct CCUS R&D or hold related patents. However, some of these, like Delta CleanTech, offer CCUS products as part of a clean technology suite.
- Eight companies that were acquired, such as CO_2 Solutions' acquisition by Italian Saipem (following the company's 2019 bankruptcy), or out of business.
- 13 companies with a dearth of information about their business status.
- 35 privately held companies at various stages of maturity (e.g., in accelerators, incubators, VC/PE). While this group also holds a mix of energy companies conducting R&D, it also contains a large number of CCUS technology-focused companies.

To answer the question, from what sources do startup and scale-up CCUS technology companies access capital, at what stages (detailed in Table 3), ICTC further narrowed down the list to privately held companies that primarily focus on CCUS technology and have information available about their funding and investment histories. Data on company investment histories was collected from Pitchbook.com.

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To learn more about exits (such as M&As), IP, and public funding in Canada's AI ecosystem, ICTC sought created a dataset of Canadian AI companies that have exited. First, ICTC used Pitchbook to generate a list of Canada-based startups that both operate within the AI industry and had exited. To be included in the dataset, (1) the company had to be listed as operating in the "artificial intelligence" vertical on Pitchbook, (2) its global headquarters had to be located in Canada, and (2) it had to have undergone a transaction that qualified as exiting (e.g., an M&A, Buyout, IPO/Reverse IPO, Bankruptcy, Out of Business, and Secondary Private Transaction). Because going out of business is a qualifying transaction, it is possible that the number of startups that have gone out of business is underrepresented due to the added difficulty of accounting for companies that are no longer active. This initial search was conducted in April, 2021.

For the IP portion of the case study, ICTC focused solely on companies that had undergone an M&A or buyout transaction. ICTC used variations of these companies' names as search terms in the USPTO, CIPO, and Google IP databases. Several types of company names were used, including the company's marketing name, legal name, names listed under the "also known as" fields on Pitchbook, and previous names (if the company's name had been changed at any point). From these databases, ICTC collected the number of patent applications the companies had made to the USPTO and CIPO pre and post acquisition, as well as the number of legal jurisdictions the companies held trademarks in.

To validate the findings, a chi-squared test was used. The test suggested that the patent-filing relationship was statistically significant (p=0.007), though the trademark-filing relationship was not (p=0.165). Notably, these figures exclude the North Inc. / Thalmic Labs acquisition as this company held at least 323 patents with the USPTO at the time of sale, making it a significant outlier. This data was accessed May and June, 2021.

For the public funding portion of the case study, ICTC again focused solely on companies that had undergone an M&A or buyout transaction. ICTC used variations of these companies' names as search terms in the Government of Canada's Grant and Contributions Proactive Disclosure Database. Several types of company names were used, including the company's marketing name, legal name, names listed under the "also known as" fields on Pitchbook, and previous names (if the company's name had been changed at any point). Importantly, the dataset does not include provincial/territorial level funding or public funding data that is not publicly accessible, such as the Scientific Research and Experimental Development (SR&ED) tax credit program (Canada's single largest program for R&D support). The dataset was compiled using Government of Canada data and Pitchbook data. Additionally, much of the public funding that goes into AI R&D is not publicly reported, meaning these figures provide only a small window into the larger picture. This data was accessed in June and July, 2021.