

Indigenous Territorial Recognition

Metro Vancouver acknowledges that the region's residents live, work, and learn on the shared territories of many Indigenous peoples, including 10 local First Nations: q́ićəý' (Katzie), q́wa:ńλ϶ń (Kwantlen), kwikwaλ϶m (Kwikwetlem), máthxwi (Matsqui), xwməθkwəy϶m (Musqueam), qiqéyt (Qayqayt), se'mya'me (Semiahmoo), Skwxwú7mesh Úxwumixw (Squamish), scəẃaθən məsteyəxw (Tsawwassen) and səlilwətat (Tsleil-Waututh).

Metro Vancouver respects the diverse and distinct histories, languages, and cultures of First Nations, Métis, and Inuit, which collectively enrich our lives and the region.

About Metro Vancouver

Metro Vancouver is a diverse organization that plans for and delivers regional utility services, including water, sewers and wastewater treatment, and solid waste management. It also regulates air quality, plans for urban growth, manages a regional parks system, delivers affordable housing, provides an economic development service through Invest Vancouver, and serves as a regional federation. The organization is a federation of 21 municipalities, one electoral area, and one treaty First Nation located in the region of the same name. The organization is governed by a Board of Directors of elected officials from each member jurisdiction.

About Invest Vancouver

Invest Vancouver is Metro Vancouver's regional economic development service. By attracting strategic investment in key export-oriented industries, conducting research and policy analysis, and fostering collaboration on a local, national, and global scale, Invest Vancouver is facilitating the creation of high-quality jobs to achieve a resilient regional economy that delivers prosperity for all residents of the Metro Vancouver region. Working closely with leaders across all levels of government in the region and beyond, Invest Vancouver is addressing regional concerns to increase economic resilience, strengthening strategic export-oriented industries, attracting word-class companies, and laying the foundation for a region where every resident can thrive in today's rapidly evolving global economy. Our data-driven, objective research aims to provide actionable intelligence to position the region for success in a rapidly evolving global economy.

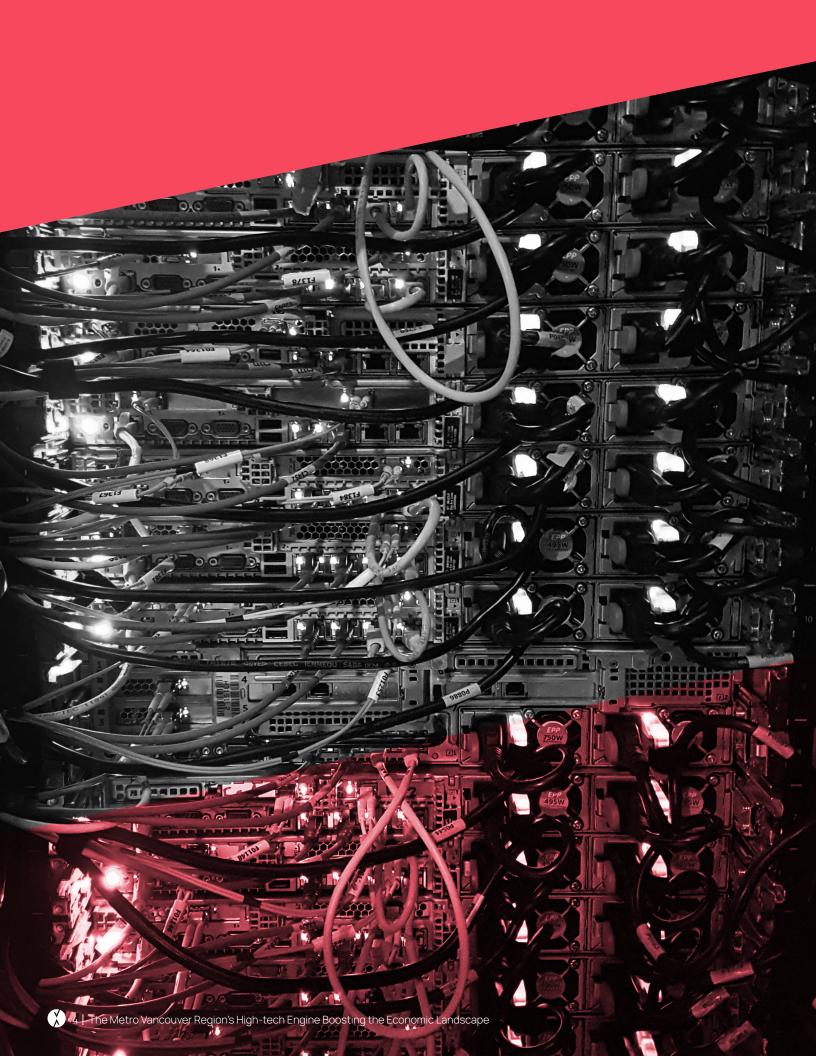
For any questions about the report contact: info@investvancouver.ca

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Contents

Overview & Methodology	5
The region's emerging technology hub	6
Employment growth in the high technology sector is outpacing the broader economy	6
Investors are backing firms in the region working on solutions for a wide variety of industries	S 8
Highly skilled talent is driving growth in the regional technology sector	12
Past performance is not necessarily indicative of future results	13



Overview & Methodology

This report snapshot utilizes three different datadriven perspectives to describe the emerging technology hub in the region. From an industry-based perspective, the BC technology sector is large, growing rapidly, and is concentrated in the Metro Vancouver region. From an investment perspective, the billions of dollars flowing into firms headquartered in the region reveal the presence of multiple specializations in a diversified technology sector that is about much more than just "pure tech". Similarly, from a labour-based perspective, occupations data confirm the presence of concentrations of skilled workers (and therefore regional specialization in the industries that rely on them) and provide compelling evidence of regional competitive advantages. The snapshot concludes by identifying persistent and emerging issues that could jeopardize continued outperformance in the sector.

The analysis relies on data from the Invest Vancouver Strategic Industries Analytics (SIA) project, additional tables from Statistics Canada and BC Stats, plus data from commercial services including PitchBook, Lightcast, Capital Compass, and fDi Benchmark.1

The report snapshot is extracted from Invest Vancouver's comprehensive analysis in "The Metro Vancouver Region's High-tech Engine: Boosting the Economic Landscape." Dive deeper into the full report to learn about the key factors that international tech firms consider when selecting a new location, how the Metro Vancouver region measures up in these areas, and a detailed analysis of the region's applied artificial intelligence (AI) sector. It also investigates regional economic development opportunities for Al solutions across healthcare, construction, and resource extraction sectors.

¹ The SIA used statistical techniques and information from multiple Statistics Canada tables to generate comprehensive, region-specific data sets for NAICS national industries. The dataset ends in 2021. Invest Vancouver, "Strategic Industries Analytics Project" (November 2023).



The region's emerging technology hub

A remarkable expansion within the technology sector is driving economic development in the Metro Vancouver region. Three data-driven perspectives highlight the growth.

- Growth in multiple technology industries is outpacing the broader economy, as shown by employment data from the Invest Vancouver SIA project.
- The region's technology firms are attracting investment for innovations applicable to a wide variety of the economy, based on activity tracked by PitchBook.
- Concentrations of workers with specialized skillsets and unique competitive advantages underpin the sector's growth, as demonstrated by trends in high-tech-related occupations.

To conclude, some of the risks that could disrupt future growth.

Employment growth in the high technology sector is outpacing the broader economy

The Metro Vancouver regional economy grew faster than the provincial economy excluding the Metro Vancouver region and the Canadian economy as a whole after the 2008 global financial crisis.² Within the regional economy, some of the fastest employment growth has been in industry components of the high technology sector.

This snapshot uses the BC Stats definition of the **high technology sector**³. Adopting the BC Stats definition of the sector, which includes a broader range of firms beyond just "deep tech," aligns better with Invest Vancouver's mandate for economic development and investment attraction, and enhances the report's compatibility with other provincial research due to varying definitions of the high technology sector.

The sector is composed of a set of North American Industry Classification System's (NAICS) national industries, which Invest Vancouver describes individually as 'industry components'. Invest Vancouver grouped the set of industry components into four industries: Digital Media & Entertainment, High-tech Services, High-tech Goods and Life Sciences, as shown in Figure 1.

^{3 &}quot;Profile of the British Columbia Technology Sector: 2020 Edition", BC Stats, March 2021. The BC Stats definition is based on national industries, the most specific category of the North American Industry Classification System (NAICS) used to organize firm level data. For industry-based data, Invest Vancouver used the same set of national industries as BC Stats. (There are two small exceptions: Invest Vancouver's data did not include testing labs or R&D in the social sciences and humanities.) For everything else, such as data covering investment activity, only the relevant categories that most closely aligned with the BC Stats definition were included.



² For the divergence between Metro Vancouver regional economy and rest of the province and the Canadian economy over the last business cycle, see Figure 2.1 in the Invest Vancouver Strategic Industries Analytics report.

Figure 1: BC's High Technology Sector

Digital Media & Entertainment Industry

Industry Components: Motion picture production, postproduction (including special effects, graphics, and animation), video game design and development, etc.

High-tech Services Industry

Industry Components: Engineering services, computer systems design, data processing and hosting, etc.

High-tech Goods Industry

Industry Components: All other electrical equipment and component manufacturing, areospace manufacturing, etc.

Life Sciences Industry

Industry Components: Pharmaceuticals and medicine manufacturing, research and development in the physical, engineering and life sciences, etc.

The large, rapidly growing high technology sector is concentrated in the region

Figure 2 presents employment in the technology sector by industry and growth since 2009 in the Metro Vancouver region and the rest of BC.

Figure 2: Technology sector employment in the Metro Vancouver region and BC excluding MV (ranked by percentage change by industry in MV since 2009)

	MV Region		BC (excluding MV)	
Industry	2021 Q4	% Change 2009-2021	2021 Q4	% Change 2009-2021
Digital Media & Entertainment	20,509	104%	4,232	77%
Life Sciences ⁴	15,519	95%	4,412	62%
High-tech Services	79,908	74%	26,513	72%
High-tech Goods	8,685	17%	2,408	10%
Total - Technology Sector	124,621	75%	37,565	66%
MV Region Economy - All Industries	1,293,948	33%	1,402,852	15%

SOURCE: INVEST VANCOUVER STRATEGIC INDUSTRIES ANALYTICS PROJECT. THE SIA DATASET ENDS IN 2021.

⁴ The regional number is a subset of the larger figure reported by Life Sciences BC, which covers the entire province and includes additional population-serving industry components. For more on the Life Sciences industry, see Invest Vancouver's report "Life Sciences in Metro Vancouver: Shaping a Globally Prominent R&D Hub" (April 2023) and the Life Sciences BC labour market intelligence study "Fostering a Globally Competitive Life Sciences Ecosystem in B.C." (February 2024).



The Metro Vancouver region's technology sector employed almost 125,000 people in 2021, an increase of 75% since 2009 and representing nearly one in every ten jobs in the region (9.6%). While the region accounted for 48% of provincial employment across all industries in 2021, it contributed 77% of BC's high technology workforce, meaning the provincial sector is highly concentrated in the Metro Vancouver region.⁵

Investors are backing firms in the region working on solutions for a wide variety of industries

Access to financial capital is vital for established firms looking to scale up and for smaller ones moving towards successful commercialization. The investment activity itself can also indicate areas of regional specialization and interest to investors. This part focuses on the deal flows and investment activity. PitchBook investment data from 2018 through 2023 shows more than \$31 billion USD in deals involving firms from the high technology sector headquartered in the Metro Vancouver region. This figure understates total investment activity in the region because it does not include the activity of multinational enterprises (see box).

Activities of Multinational Enterprises

Investments by multinational enterprises are a poorly tracked but vital source of growth in the regional technology sector. **Fortinet**, a major cybersecurity company, Disney's **Industrial Light & Magic**, and **Intel**, for example, have been in the region for many years and have expanded their operations multiple times.

Microsoft expanded its cloud services operations in the region in 2020; added 500 technical positions in 2021; announced in 2022 plans for a new 20-storey office hub in downtown Vancouver; and has reportedly begun relocating artificial intelligence staff from China to Vancouver.

Electronic Arts (EA), one of the largest interactive entertainment companies in the world, added two new buildings at its Burnaby campus in 2021 to accommodate an additional 500 workers.

The data is presented in three ways:

- 1. Annual investment totals to show broad trends in activity across the sector as a whole.
- 2. PitchBook's "industry verticals" that group together firms that focus on a shared niche or specialized market spanning multiple industries. Verticals include areas such as "Cybersecurity", "FinTech", "Quantum Technology", and "Mobility Tech".
- 3. The target industries benefitting from the technology firms' solutions.

⁷ Except for purchases of existing firms headquartered in the region (which are tracked by PitchBook), no data source provides complete coverage of the many incremental investments by multinational firms expanding their operations in the region.



⁵ The tech sector is also concentrated in the region based on GDP. The region accounted for 57% of total provincial GDP in 2020; in BC's high technology sector, it contributed 77% of GDP.

⁶ PitchBook tracks investment activity in US dollars and does not organize its data by NAICS codes. Deals were included based on congruence with the high technology sector as defined by BC Stats.

The distinction between the two more granular perspectives (industry verticals and target industry) is the difference between the views of an investor and investee. For example, a single transaction could be characterized as both "cleantech" (from an industry verticals standpoint) and "mining" (using the industry target approach). The former is the view of the investment manager who says, "My fund invests in cleantech firms." The latter is the perspective of the investment recipient firm, which says it "develops water treatment solutions for the mining industry." Thus, the transaction is an investment in a cleantech firm supplying solutions for the mining industry. Both perspectives provide insights into the diversity of technology specializations attracting investor interest in the region.

Robust investment activity despite the pandemic

Investment activity in the high technology sector is shown in Figure 3.

Figure 3: Investments in high-tech firms headquartered in the Metro Vancouver region (USD billions)



SOURCE: PITCHBOOK

Notable Investment Deals, 2018-2023

Galvanize, a SaaS company that develops governance, risk management and compliance software, was acquired by Diligient in April 2021, for \$1 billion USD.

Dapper Labs, a developer of blockchain-enabled applications, has raised \$643.4 million USD since 2018.

Svante, a firm developing technology for efficiently capturing and purifying CO2 from industrial emissions, raised \$439 million USD in three rounds of venture funding, 2018-2023.

Xenon Pharmaceuticals, a clinical-stage biopharmaceutical company, raised \$300 million in 2023

In early 2020, the COVID-19 pandemic initially curtailed investment, but the pandemic effects are not visible in the annual investment total due to a strong rebound in the latter half of the year. The \$10.3 billion invested in 2021 marks a multi-year peak. In 2022, the sharp drop to \$4.3 billion mirrored declines in investment activity elsewhere in Canada and the US amid supply chain disruptions, rising inflation, higher interest rates, and investor uncertainty.8 Even so, investment activity rebounded to \$5.2 billion in 2023, exceeding the annual totals in the two years immediately preceding the pandemic.

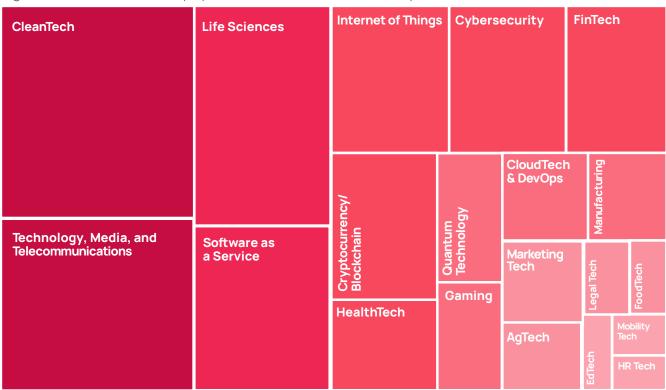
Aleksandra Sagan, "IPO Outlook 2023: Will More Canadian Tech Companies Brave the Markets in the Year Ahead?" The Logic, February 6, 2023.

Investors are pursing deals in multiple regional specializations in high technology

Invest Vancouver reviewed all of the high technology transactions from 2018 to 2023 involving firms headquartered in the region. To avoid double counting, each firm was assigned to a single industry vertical that most closely matched their primary activity.

Figure 4 shows the 20 largest technology-related verticals by investment size in the Metro Vancouver region. The box size corresponds to the value of the deals in the vertical (larger boxes indicate more investment); however, the size is an approximation due to limitations with the PitchBook data. Cleantech, TMT (technology, media and telecoms, which includes many Digital Media Entertainment firms), Life Sciences, Software as a Service (SaaS), Cybersecurity, Internet of Things, FinTech (Financial technology), and Cryptocurrency/Blockchain are the high technology specializations that have attracted the most investment in firms headquartered in the region 2018 through 2023.

Figure 4: Investment Activity by Vertical in Metro Vancouver (by value, total of 2018-2023)



SOURCE: INVEST VANCOUVER COMPILATION OF PITCHBOOK DATA.

⁹ PitchBook provides tags to help users quickly find companies working in areas they are interested in such as "cleantech" or "robotics and drones". The tags are not exclusive, however, as there is significant conceptual overlap between verticals, e.g. "cleantech" and "climate tech" and PitchBook assigns many firms to multiple verticals. In addition, the tags for verticals are assigned inconsistently and sometimes not at all.

¹⁰ Virtual reality/augmented reality (VR/AR), a growing specialization in the region, was the 21st largest vertical.

The investment verticals show how investors look at the technology sector, which is important when attracting new investment. To understand the linkages between the high technology sector and the rest of the economy, however, it is helpful to consider investment activity based on the industry of the end users.

Target industries indicate the diversity of the region's technology sector

In Figure 5, investment activity is organized in firms headquartered in the Metro Vancouver region, 2018 to 2023, based on the target industry of the technology firms. For example, the retail category shows the value of investments in firms providing software or

other technology solutions to businesses in those areas. Firms focused on information technology drew the most investment activity, at \$18.0 billion. However, there were also significant investments in firms providing solutions in healthcare, energy, and materials and resources, reflecting the intersection between traditional (non-technology) industries and the technology sector. This investment variety demonstrates how technology firms are increasingly crucial to the innovation and advancement within traditional sectors

Figure 5: Investments in the High-tech Firms Headquartered in Metro Vancouver by target industry (2018-2023, USD millions)

Information Technology	\$18,016.7	Energy	\$1,335.0
Software	10,044.8	Energy Equipment	686.6
Communications and Networking	3,533.1	Exploration, Production and Refining	417.5
Computer Hardware	2,183.6	Energy Services	230.5
IT Services	1,941.7	Other Energy	
Semiconductors	313.5		
Healthcare	\$5,023.1	Consumer Products and Services (B2C)	\$1,165.3
Pharmaceuticals and Biotechnology	3,669.7	Transportation	361.8
Healthcare Devices and Supplies	616.5	Consumer Non-Durables	234.8
Healthcare Services	499.7	Retail	130.0
Healthcare Technology Systems	237.2	Restaurants, Hotels and Leisure	126.7
Business Products and Services (B2B)	\$3,272.3	Services (Non-Financial)	\$103.9
Commercial Services	2,029.7	Media	99.5
Commercial Products	1,209.3	Consumer Durables	63.8
Other Business Products and Services	32.3	Apparel and Accessories	
Commercial Transportation	1.0		
Materials and Resources	\$1,607.4	Financial Services	\$1,063.8
Metals, Minerals and Mining	1,178.4	Other Financial Services	758.7
Chemicals and Gases	188.0	Capital Markets/Institutions	254.4
Agriculture	115.8	Commercial Banks	29.2
Other Materials	75.1	Insurance	21.5
Containers and Packaging	50.2		
	Grand Tota	I: \$31,483.5	

SOURCE: PITCHBOOK

Highly skilled talent is driving growth in the regional technology sector

Firms looking for talent in high-technology fields will find it in the Metro Vancouver region, which has significant concentrations of talent in multiple occupations related to technology. Concentrations of talent indicate regional specializations in the industries that rely on those occupations, and occupational growth patterns provide compelling evidence of regional competitive advantages. Both factors – industrial specialization and a business environment that fosters competitive advantages – are important considerations for firms making location decisions.

The analysis in this section covers 51 occupations related to the technology sector. Employment increased in 46 of the 51 technology-related occupations, 2009 to 2023, and in most of the occupations, it grew much faster than the overall regional employment.

Talent is concentrated in the region in multiple high-technology fields

The "employment concentration ratio" is an effective economic tool for analyzing how focused an economy is on specific industries by comparing the share of the workforce in an occupation locally to the national share. The default assumption is that the share is the same, in which case the employment concentration is 1.0. The employment concentration value rises when an occupation's share of regional employment is higher than the national share, and falls when it is less. For example, a concentration ratio of 2.0 indicates that the occupation's share of regional employment is two times greater than its share of national employment.

In 2023, the Metro Vancouver region had significant regional talent concentrations in high tech occupations related to High-tech Services and Digital Media & Entertainment. In High-tech Services, the region has concentrations of software engineers and designers (concentration ratio of 2.6), information systems testing technicians (2.1), and computer systems developers and programmers (1.6). It also has mining-related engineering talent, including geological engineers (2.1), mining engineers (1.6), and geoscientists and oceanographers (1.6). The presence of hundreds of mineral exploration companies headquartered in the Metro Vancouver region helps explain these concentrations.¹³ As one of Canada's principal centres for motion picture production, the region also has a high concentration of employment in related occupations, including those in film production (e.g., motion pictures... assistants and operators (3.8) and audio and recording technicians (2.1)), as well as visual effects and animation (e.g., graphic arts technicians (1.9)).

Employment growth patterns reveal regional competitive advantages

Further evidence for competitive advantages in high technology fields in the Metro Vancouver region can be found using "shift-share analysis", an economic technique for spotting regional comparative advantages and specializations using changes in occupation data. The technique compares "expected

¹³ There are approximately 800 mineral exploration companies headquartered in the region, including two of the largest mining companies in the world, Teck Resources Limited and Goldcorp Inc. Vancouver Economic Commission, "Other Sectors" (September 7, 2022).



Statistics Canada organizes occupation data using the 2021 National Occupation Classification (NOC) codes, a hierarchy that gets increasingly specific as it moves through five levels from 10 broad occupational categories to 516 unit groups. Invest Vancouver reviewed all 516 unit groups, identified the 51 most relevant to the high technology sector, and then analyzed regional data for those 51 from Lightcast.

¹² The employment concentration ratio is also known as a 'location quotient'.

employment" (i.e. how much regional employment in an occupation would change if it followed national trends) with actual employment changes observed over a given period. The difference between these figures, the expected and actual changes, is the "competitive effect." This effect is generally attributable to a unique combination of regional characteristics and trends. Identifying a competitive effect can indicate where to look for the regional strengths or weaknesses that produced it.

Invest Vancouver analyzed Metro Vancouver regional employment growth in 51 tech occupations from 2009 to 2023. The shift-share analysis revealed a competitive effect in many of the occupations, indicating an advantage for firms in the region in industries that rely on those workers. Of particular note, the analysis showed:

- A large competitive effect in many occupations related to High-tech Services, including software engineers and designers, software developers and programmers, computer systems developers and programmers and information system specialists.
- Evidence of strengths in the Life Sciences (biologists and related scientists) and connections between the regional technology sector and resource industries in the province (geological engineers and mining engineers).
- Other strengths, such as in *mechanical engineers* and industrial and manufacturing engineers. People in these occupations are often employed by consulting firms, which is a known strength in the region (professional, scientific, and technical services is the second largest industry by employment in the region).

Overall, the occupations-based analysis underscores the importance of the region's specialized tech workforce. The data show concentrations of talent in the region, indicating clustering in the industries that rely on those occupations, and strong competitive effects, confirming firms in those industries enjoy some form of competitive advantage.

Past performance is not necessarily indicative of future results

The empirical evidence reflects the notable advancements in the Metro Vancouver region's technology sector. Although many of the factors that contributed to the sector's success are still in place, continued growth is not a given. Below are some points that might interrupt or hinder the pace of growth:

- Talent supply could limit growth. Continued growth will depend critically on the sufficient supply of suitable talent, as determined by education and recruitment: the former to create new graduates and help existing workers improve their skills, the latter to attract skilled foreigners and expats who might be willing to return. Since many firms in the technology sector require the same or similar skillsets, there is competition for talent within the region, meaning growth in one industry might come at the expense of another. Similarly, there is global competition for talent, with regions vying to attract and keep talent.
- The rising cost of living could weaken the region's appeal. Persistent high costs in areas such as housing, if not offset by commensurately higher salaries, will leave residents with lower disposable incomes. If people feel priced out of the region, it could make it harder to attract and retain workers and therefore more difficult to attract foreign direct investment.



- Exports and outperformance go together. In the region, the technology sector has grown much faster than the overall economy. This could be due to exports spurred by global demand and/or the integration of new technologies and services into the other parts of the BC economy. While supplying other sectors with goods and services is an important contribution to GDP, exports offer the best prospects for continued growth. Unlike population-serving firms reliant on local demand, competitive exporting firms can grow faster than the local population and economy.¹⁴
- Firms struggle to scale up in the region. In the Metro Vancouver region in 2021, only 2.6% of tech firms employed 100 people or more, and just 20 firms employed 500 people or more. A higher proportion of larger firms is desirable due to their tendency to allocate greater resources to R&D, exhibit higher productivity levels, offer higher salaries to their employees, and export more per employee compared to smaller counterparts.¹⁵
- Productivity growth has been weak. Since the early 2000s Canada has experienced relatively low labour productivity growth, ranking in the bottom third in the OECD from 2000 to 2019. If this trend continues, it could dampen the Metro Vancouver region's economic outlook and its competitiveness relative to jurisdictions with higher output per worker.

- Industrial land is scarce and expensive. The economics look very different for established firms with their own facilities and new entrants looking for space. In the high-tech sector, this is particularly true for manufacturers. Newer firms may be more likely to conduct research, design, and development work in the region, while physically producing goods at scale elsewhere.
- FDI attraction competition is intensifying. In Digital Media & Entertainment industry, each new production represents a location decision, making the industry highly mobile. BC's early move on tax credits was successful, but Quebec, Ontario, multiple US states, the UK, and Australia now offer competing incentives. Feature film activity is less frequent in the region as a result. Production activity and a skilled labour force complement one another, with concentrations of specialized talent attracting productions, and vice versa. If workers find there are long gaps between jobs, they tend to leave for areas with greater opportunities. Therefore, the industry's future is tightly bound to tax credit policy.
- Artificial intelligence is a wildcard. The adoption of Al could derail the pattern of growth in the region's high technology sector if its adoption eliminates (or reduces) the human requirement in certain types of work. Conversely, the practical application of Al by the region's technology sector (and even by firms in more traditional industries, such as mining) might boost growth and create entirely new activities.

BC has a large trade surplus in high technology services, i.e. the province exports more than it imports. The surplus widened, 2010-2019. BC has a trade deficit in high-tech goods, which widened from 2010 through 2019. BC Stats, "Profile of the British Columbia Technology Sector: 2020 Edition" (March 2021).

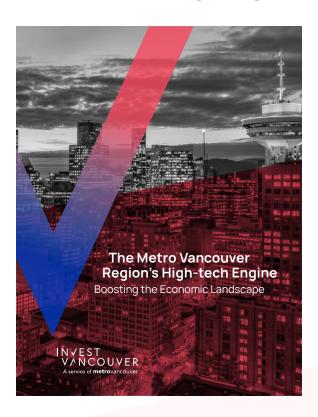
The prevalence of small firms in the technology sector reflects patterns in the broader BC economy, where 98% of all businesses employed 50 or fewer workers in 2022. Small businesses contribute 34% of BC's GDP, the highest proportion in Canada, and account for 51% of private sector employment, the second highest in the country. In the technology sector, many of the largest employers locally are branches of multinational enterprises, which further highlights the rarity of local firms scaling up. Province of British Columbia, "High Technology" (September 25, 2023); Ken Peacock and Jock Finlayson, "From Good to Great: The Benefits of Scaling up BC Business," Business Council of British Columbia, November 2017; BC Stats "Small Business Profile."

¹⁶ Canada ranked 25th of 36 OECD countries in terms of productivity growth from 2000 to 2019. David Williams, "Low Productivity Growth Is Holding Back Canadians' Pay Growth", Business Council of British Columbia, July 2021.

Interested in reading more about the high-tech sector in the Metro Vancouver region?

Check out Invest Vancouver's comprehensive analysis in

"The Metro Vancouver Region's High-tech Engine: Boosting the Economic Landscape."



Prepared by Invest Vancouver

Lejla Uzicanin, Vice President, Data, Research and Policy

Gregory Freeman, Senior Economist

Aaron Aerts, Senior Advisor

Temirlan Kakimov, Research & Data Analyst

Ryan Carpio, Research Coordinator

