



Hemispheric Partners

Trade, Technology, and Innovation Ties
Between the Bay Area and Canada

April 2019

Acknowledgments

This report was developed and written by Sean Randolph, Senior Director at the Bay Area Council Economic Institute, and Niels Erich, a consultant to the Institute. The Institute wishes to thank the report's sponsors: Global Affairs Canada, Air Canada, and Silicon Valley Bank. We also gratefully acknowledge the advice, information and insight provided by many people who made their time available for interviews:

Mark Agnew, Senior Director–International Policy,
Canadian Chamber of Commerce

Estelle Alberts, Regional Sales Manager, Air Canada

Win Bear, Head of Business Development, Canada,
Silicon Valley Bank

Yves Beaulieu, Consul, Consulate General of Canada–
San Francisco

Laura Buhler, Executive Director, C-100

Serge Corbeil, Director–Government Relations Western
Region, Air Canada

Michael Deschenes, Managing Director and COO,
Perimeter Institute for Theoretical Physics

Iain Evans, Technology Lead, Digital Technology
Supercluster

Vincent Gauthier-Doré, Director Business
Development–USA, Air Canada

Iain Klugman, CEO, Communitech

Anthony Lee, Partner, Altos Ventures

Jayson Myers, CEO, Next Generation Manufacturing
Canada

Moura Quayle, Director pro tem, School of Public Policy
and Global Affairs, University of British Columbia

Roseann O'Reilly Runte, President & CEO, Canada
Foundation for Innovation

Rana Sarkar, Consul General, Consulate General of
Canada–San Francisco

Jacques Shore, Partner, Gowling WLG

Trevin Stratton, Chief Economist, Canadian Chamber
of Commerce

Jen Thompson, Marketing Manager, Silicon Valley Bank

Warren Wall, Executive Vice President, Corporate
Affairs, D-Wave Systems

Contents

Executive Summary 1

CHAPTER 1

Canada's Economy: Growth and Transition..... 3

A Current Snapshot 5

Real Estate/Construction..... 6

Manufacturing 7

Energy..... 9

Mining..... 12

Financial Services 12

CHAPTER 2

Trade: Integrated Markets 15

A Thriving, Interdependent Energy Market..... 18

California and the Bay Area 18

Growing Air Links..... 20

Trade Friction Fallout..... 20

CHAPTER 3

FDI: Interconnected by Investment..... 25

California Investment..... 28

CHAPTER 4

**Canadians in Silicon Valley:
Human Capital and Commerce** 33

Network Integration 36

Financing the Boom..... 39

University Ties..... 41

CHAPTER 5

Canada's Evolving Tech Ecosystem 43

Where Science Meets Economic Development 47

Build It and They Will Come 48

A Tale of Two Visas 56

Conclusion: Building Synergy and Alignment 59

Notes..... 60



Executive Summary

No two economies are more closely connected than those of Canada and the United States—with unprecedented flows of trade, investment, water, power, people, and technology.

Canada, like other developed economies, has experienced slow, steady post-2008 recession growth. After 3% real GDP growth in 2017 and a 2% growth rate in the third quarter of 2018, the Royal Bank of Canada expects the GDP growth rate for 2019 to be 1.7%. Real estate and construction together form the largest component of GDP (20%), the other leading contributors being energy (11%), manufacturing (10%), financial services (7%), and mining (3.6%). Manufacturing is growing, but the economy has seen volatility from fluctuating oil and other commodity prices. Uncertainties surrounding trade with the United States, and a concern with over-reliance on its traditional strength in natural resources, is prompting a heightened focus on competitiveness and innovation. This has become one of the strongest points of connection between the Bay Area and Canada.

Canada has consistently been the largest global market for US goods exports. While the US runs a small goods trade deficit with Canada, it runs a net surplus due to

high-value services and technology exports. A large share of US-Canada trade is complementary, in part due to bilateral trade agreements spanning three decades. Supply chains between the countries, particularly in the automotive sector, are deeply interwoven.

Canada is California's second largest trading partner after Mexico. It is an important supplier of natural gas and hydroelectric power to California utilities and industrial customers; California buys roughly 75% of British Columbia's hydropower exports to the Western US. California exports mainly electronic (computing, audio-visual, telecommunications, optical, medical) equipment and agricultural commodities—much of them from Bay Area counties—and in turn buys vehicles, energy, meat, seafood, plastics, and wood products. More than half of California's services exports to Canada are technology-related—including business, professional & technical services, telecommunications, and royalties/licenses—with the remainder mainly in tourism and financial services.

On the whole, California has been little affected by recent tariff frictions and the renegotiation of NAFTA; California wineries won concessions on retail display; California lumber producers have benefitted from

tariffs, but higher lumber import prices could add to California's already high construction costs. Uncertainties continue over the ratification and implementation of the US-Mexico-Canada Agreement (USMCA), which is intended to replace NAFTA and modifies but does not fundamentally change its key provisions. The Trans-Pacific Partnership (TPP) trade agreement, to which both the US and Canada were parties, has been replaced by the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which the government of Canada has championed. The US withdrawal from TPP in 2017 and its absence from CPTPP—an agreement among the 11 remaining parties to reduce trade and investment barriers and address issues such as intellectual property and cross-border data flows—will make California and US exports less competitive with Canadian exports in a range of Asian markets, including Japan.

Two-way US-Canada foreign direct investment (FDI) is roughly balanced; the US accounted for more than half of the stock of FDI into Canada, while Canada was the second largest source of the stock of FDI into the US in 2017. The flow of FDI into Canada saw a net decline in 2017, in part due to a slump in the energy sector, but rebounded in 2018 with new manufacturing, tech, logistics, and financial services investment. Southern California's large population and manufacturing base have attracted a larger share of Canadian manufacturing, aerospace, and retail investment; the Bay Area has drawn more technology, biotech, renewable energy, and finance investment.

With the loss in the 2000s of technology industry leaders, such as RIM (Blackberry) and Nortel Networks, and an overreliance on natural resources, Canada today is increasingly driving toward an economy that is innovation led. Its efforts to diversify, attract global talent, and move up the skills and employment value chain are yielding impressive results in secondary and post-secondary education, research, and technology fields such as AI.

Under a consolidated Ministry of Innovation, Science and Economic Development, Ottawa has established regional innovation "superclusters" across Canada to attract public and private investment in education,

basic research, and entrepreneurship. The Toronto, Montreal, Quebec City, and Vancouver metro areas have developed dynamic university, incubator/accelerator, and VC funding networks; in rural and maritime provinces, entrepreneurs are developing digital and AI solutions in mining, agriculture, forestry, fisheries, and renewable energy. Toronto, Vancouver, and Montreal are growing tech hubs.

Canada's large presence in the Bay Area provides a counterpoint to these developments inside Canada. Canadians occupy leading executive positions in a wide range of Bay Area companies, particularly in tech. Canada, alongside Israel, is also the leading source of immigrant founders of billion-dollar companies in the US; of nine such companies, six are in the Bay Area. C100, a leadership group of senior Canadian executives, provides a support network for Canadian entrepreneurs in the Bay Area. Leading Canadian financial institutions such as Royal Bank of Canada are active in Silicon Valley, mirroring investment in Canada by large Bay Area companies such as Wells Fargo Bank and Silicon Valley Bank, which has a strong focus on startups and lending in the tech and life sciences space. Many of the Bay Area's leading venture capital firms are active in Canada, particularly in Toronto.

Despite Canada's earlier fears of a tech "brain drain," Canada and key US tech corridors—especially Silicon Valley—have maintained a healthy back-and-forth ebb and flow of talent. Silicon Valley continues to draw Canadian talent due to the size of the US market, the availability of venture funding at scale, the global platform it presents, opportunities to engage with customers and partners, and the depth of technology available there. As Canada's tech sector advances, some Silicon Valley entrepreneurs are also moving northward, drawn by lower living costs, access to funding alternatives, and world-class tech clusters in AI, gaming, cleantech, and health care. These flows of capital, research, and talent provide distinct synergies between the Bay Area and Canada and a strong foundation for further growth. Canadian and California interests further align around issues such as climate change, where the Province of Quebec participates in the Western Climate Initiative, which links the two jurisdictions' cap-and-trade systems and carbon markets.



Canada's Economy: Growth and Transition

Key Takeaways:

- No two economies are more closely connected than those of Canada and the United States—with unprecedented flows of trade, investment, water, power, people, and technology.
- Canada, like other developed economies, has seen slow, steady post-2008 recession growth, though its resource-reliant economy has hit rough patches due to fluctuating oil and other commodity prices.
- A construction and property boom—spurred by an energy boom in the prairies and foreign real estate investment inflows to Toronto and Vancouver—has made real estate and construction together the largest component of Canada's GDP (20%).
- The other leading contributors to GDP are manufacturing (10%), energy (11%), mining (3.6%), and financial services (7%).
- The Royal Bank of Canada expects the GDP growth rate for 2019 overall to be 1.7%. Unemployment has been falling and wages have been rising; business investment is up.

In many respects, Canada's economy is ideal—rich in natural resources, with a well-educated diverse workforce skilled in high-value manufacturing and technology, and with modern infrastructure, livable cities, and a strong focus in traditional sectors that have high job multipliers, such as housing construction, automobile and component manufacturing, and agriculture.

Canada is far from insular, however. It is linked to global markets and open to immigrants, attracting trade, foreign investment, and global talent. It is also subject to volatile commodity prices, exchange rate fluctuations and trade disputes—most often, of late, with its very large neighbor to the south.

No two economies are more closely interconnected than those of Canada and the United States. Across the longest international border between two countries—more than 5,525 miles between the lower 48 states and Alaska—flow unprecedented trade, investment, people, shared water and power, shared technology, and shared history and democratic values.

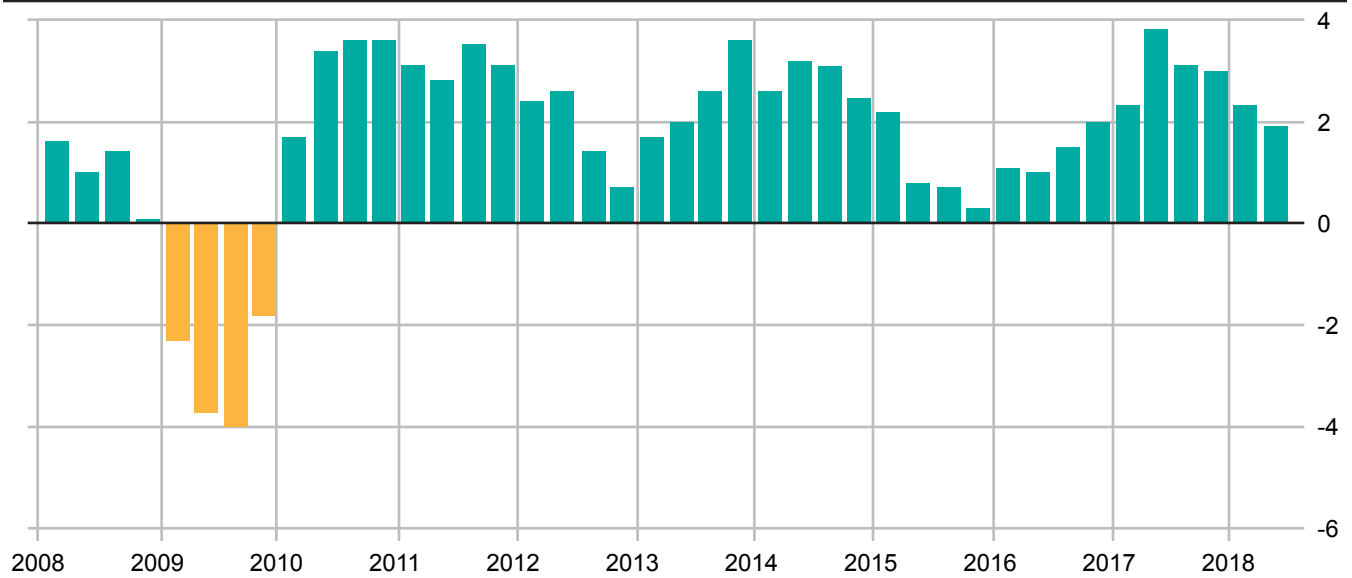
In population and nominal GDP, the US and Canada maintain a roughly 10:1 relationship (327 million versus 37 million residents and \$19.3 trillion versus \$1.7 trillion in 2017 GDP).¹ Yet the whole of North America far exceeds the sum of its parts as an economic engine, and Canada's steady growth and measured approach to macroeconomic policy have contributed to stability in the relationship over time.

Canada recovered more quickly from the 2008 global recession than either the US or most of Europe, largely because its banks were better capitalized and less exposed to subprime lending and mortgage-backed securities. By July 2009, the economy was showing signs of growth, with a sustained recovery beginning in the fourth quarter. The economy grew by 3.3% in 2010.²

EXHIBIT 1

Canada recovered more quickly from the 2008 global recession than either the US or most of Europe; from contracting 2.6% in 2009, the economy grew by 3.3% in 2010.

Canada GDP Annual Percentage Growth Rate, quarterly data, 2008-q1 to 2018-q2

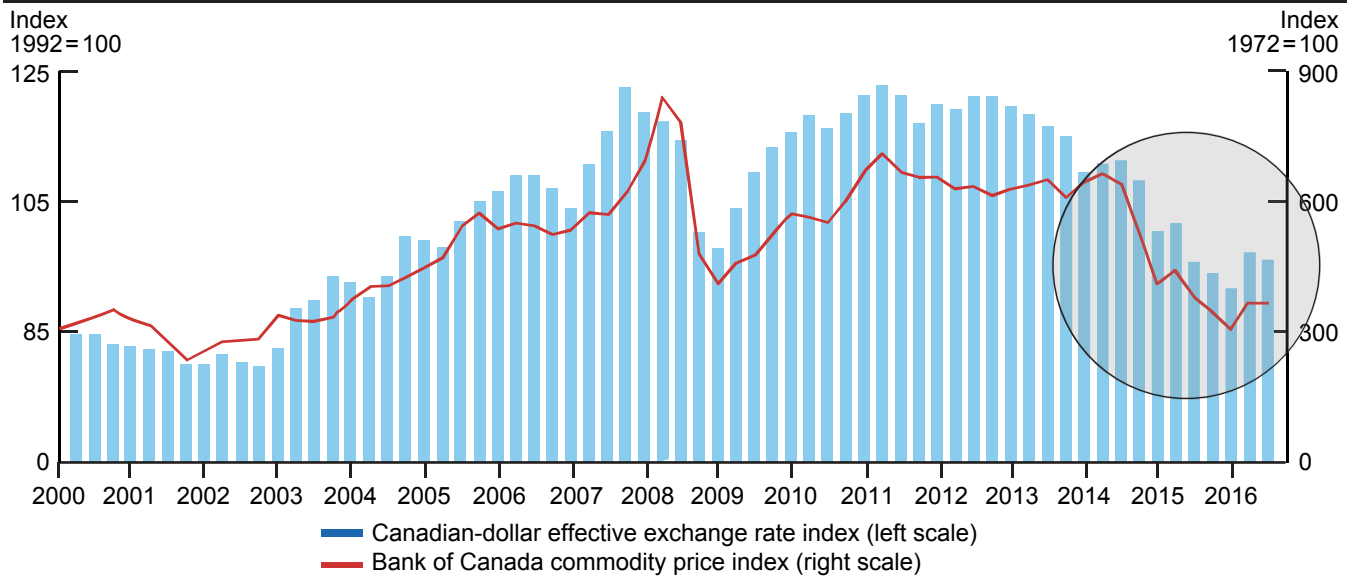


Source: Trading Economics.com | Statistics Canada

EXHIBIT 2

The period from mid-2014 through early 2016 saw an economic dip from falling commodity prices and exchange rates.

Movements in Commodity Prices vs. Value of Canadian Dollars, quarterly data, 2000-q1 to 2016-q3



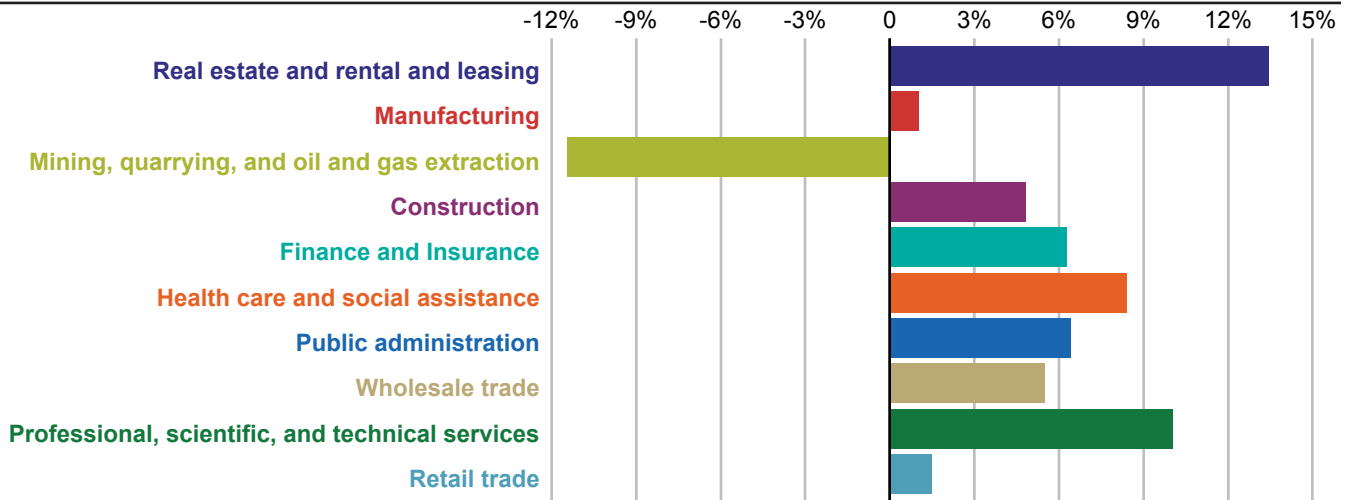
Source: Bank of Canada calculations

Last observation: 2016-q3

EXHIBIT 3

Over time, the makeup of Canada's economy has shifted from resources and traditional manufacturing to advanced manufacturing, technology, and services—real estate/construction, finance, health care, and retail.

Percentage Change in Labor Force Size of Selected Canadian Industry Sectors Between 2014 and 2018



Source: Statistics Canada

Analysis: Bay Area Council Economic Institute

Growth has continued since 2010, albeit with significant fluctuations in oil prices, property, retail, and trade. The impacts have been unevenly distributed across Canada's 10 provinces and 3 territories, with a shale oil boom spurring exploration and development, pipeline construction, new housing, and support businesses like trucking and rig supplies in Alberta and Saskatchewan; manufacturing and technology growth in Ontario and Montreal; new tech clusters and soaring construction demand in greater Vancouver; but slower growth in the remaining provinces.

Commodity prices in particular have been a source of volatility, as during the period from mid-2014 through early 2016 prices for two dozen commodities listed in the Bank of Canada's commodity price index fell by an aggregate 54% and the West Texas Intermediate crude oil price dropped from US\$106 to \$30 per barrel. Also during that period the Canada-US exchange rate fell from US\$0.91 to \$0.72—a double hit for low-margin producers shipping up to 90% of their product by value to the US.³ The vulnerability this exposed underlies in part the government's current push to diversify the economy through technology and innovation.

A Current Snapshot

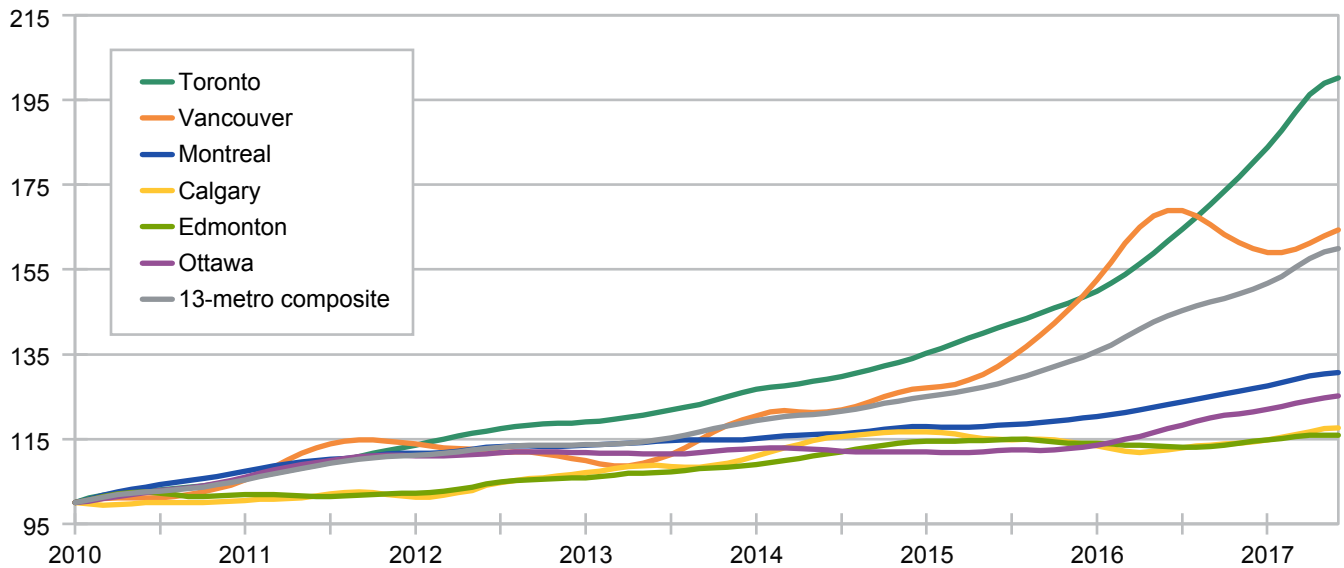
In its January 2019 Monetary Policy Report, the Royal Bank of Canada forecasts a 1.7% GDP growth rate for 2019.⁴ The national unemployment rate has fallen from 6.7% at the beginning of 2017⁵ to 6% in August 2018,⁶ with lower average rates in British Columbia (4.9%), Ontario (5.6%) and Quebec (5.5%),⁷ as wages have ticked upward.

Over time, the makeup of Canada's economy has shifted from resources and traditional manufacturing to advanced manufacturing, technology, and services—real estate/construction, finance, health care, and retail. Growing foreign business and residential investment have accelerated this trend. "We're actually in the midst of two transitions happening at once," says Canadian Chamber of Commerce chief economist Trevin Stratton, "a sectoral one that builds on our traditional strengths in natural resources and energy with new investments in technology, life sciences and innovation, and a lagging transition in the drivers of economic growth, from consumer spending and housing to innovation and increased business investment, including increased foreign investment."⁸

EXHIBIT 4

Canada’s housing markets vary considerably: cash purchases by wealthy, often foreign, buyers have priced some local buyers out of popular metros like Toronto and Vancouver.

RPS Real Property Solutions Composite Index of House Prices, January 2010=100, Seasonally Adjusted



Sources: RPS | Moody’s Analytics

Five sectors that together make up roughly half of Canada’s economy illustrate the pace of change: real estate/construction, manufacturing, energy, mining, and financial services.

Real Estate/Construction

Real estate and construction together account for about 20% of Canada’s GDP.⁹ Housing markets vary considerably, with oversupply in places like Calgary and Edmonton caused by lower oil and commodity prices, to robust demand in major urban centers that are more technology driven. Cash purchases by wealthy, often foreign, buyers have priced some local buyers out of popular metros like Toronto and Vancouver.

To cool overheated markets, the government has tightened borrowing rules, most notably adding a “stress test” that requires buyers to qualify for a mortgage at the Bank of Canada benchmark five-year mortgage rate, which went up to 5.34% in mid 2018, in order to get a lower rate from a bank.¹⁰ British Columbia and Ontario have additionally imposed 15% taxes on foreign buyers.¹¹ British Columbia has a further 5%

transfer tax on properties valued at over C\$3 million (US\$2.32 million) and is considering a 0.5% “speculation tax” for unoccupied homes whose owners pay no income tax in the province.¹²

In the commercial segment, a the PwC/Urban Land Institute 2018 Emerging Trends in Real Estate report¹³ shows that urban commercial real estate in Canada is close to fully invested, with demand focused in the Class A office and industrial segments. This has prompted investors and developers to upgrade existing properties, sell off Class B and C buildings in an effort to trade up, or redevelop areas with growth potential—all to optimize cash flow and lower operating costs across their properties.

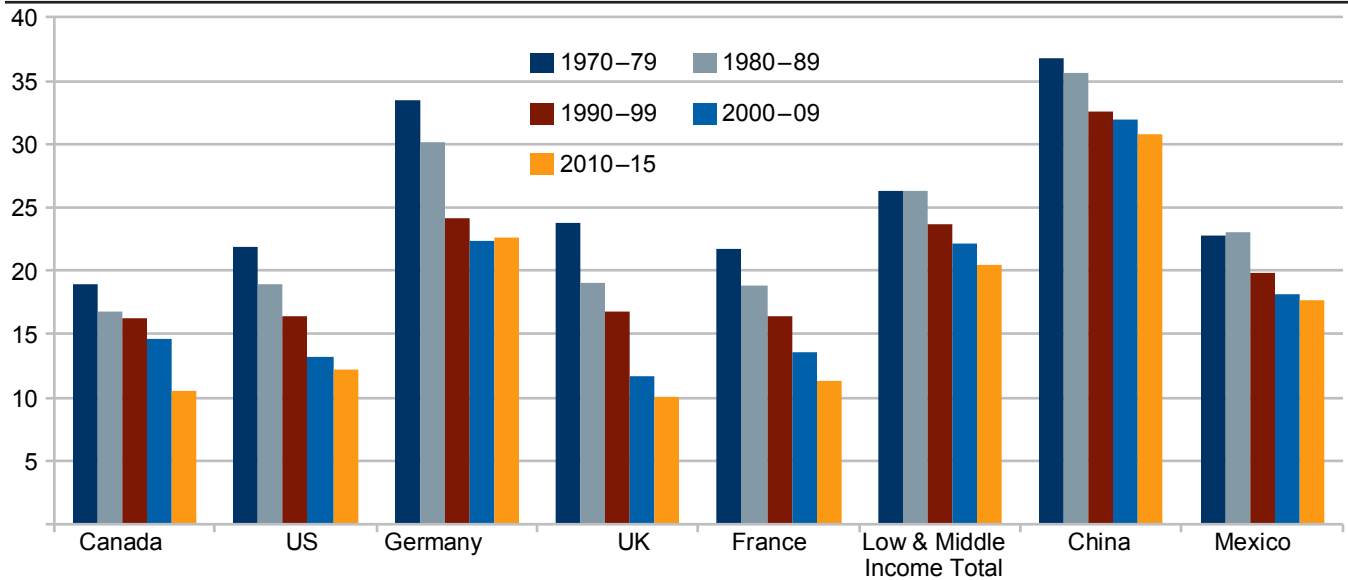
The following are among the key trends seen in commercial real estate in 2018:

- A 64.77% e-commerce penetration rate in January 2017 and a share of retail sales across Canada expected to reach 8% have led mall, department store, and big-box retailers to convert unused space to e-commerce fulfillment, pop-up stores, gyms, medical labs, and public space for dining and events.¹⁴

EXHIBIT 5

As is common in developed countries where rising incomes translate into increased consumer and business spending on services, Canada's manufacturing sector is shrinking as a share of the economy.

Manufacturing's Share of GDP by Country, average percent of GDP per time period



Source: Haver Analytics, RBC Economic Research

- Growth in e-commerce has also driven up distribution center demand, with an emphasis on multi-level properties with high ceilings and large bays that are fully wired to accommodate warehouse automation.
- In Toronto and Vancouver, office vacancy rates are low, no new space is coming onstream until at least 2020–2022, and lease rates are rising.¹⁵
- Edmonton and Calgary are seeing steady economic growth, but not enough to work off excess office supply, with 14.1% and 23.5% respective vacancy rates in early 2018.¹⁶

Manufacturing

Manufacturing accounts for 10% of Canada's GDP—C\$174 billion (US\$135 billion)—and 68% of exports, contributing 1.7 million full-time jobs to the economy.¹⁷

As is common in developed countries where rising incomes translate into increased consumer and business spending on services, manufacturing is shrinking as a share of the economy. Offshoring has played a role, but the

contraction is relative, being mostly due to productivity gains and stronger growth in services and technology.

The automotive sector accounts for 10% of Canada's manufacturing GDP¹⁸ and accounted for 14% of its goods exports in 2017.¹⁹ The Canadian and US automotive manufacturing industries are broadly integrated, with deeply connected supply chains. In the average motor vehicle manufactured in Canada and shipped to the US, 48.3% of the parts were made in the US. Similarly, the automotive component parts shipped from Canada to the US have an average of 28% US-made content.

Ontario is a significant manufacturing hub, employing more than 40% of Canada's manufacturing workforce.²⁰ Directly north of Detroit and connected by the cross-border Detroit-Windsor Tunnel, Ontario is a center for auto and vehicle component manufacturing and accounts for 100% of Canada's light vehicle production, 400 parts manufacturers, and 94% of industry shipments.²¹ Ford, General Motors, and Fiat Chrysler all have Canadian headquarters, assembly facilities, and parts suppliers in Ontario; Toyota, Lexus, and Honda ship

parts from Japan and assemble in Ontario for the North American market. Canadian production totaled about 2.2 million vehicles in 2017.²² Ontario also supports a robust plastics industry. All of Ontario’s top three manufacturing industries—automotive, plastics, and printing—are heavily dependent on exports to the US.

Quebec is home to 52% of the Canadian aerospace industry’s production, representing sales of C\$14.4 billion in 2017.²³ Bombardier, Pratt & Whitney Canada, and Bell Textron Helicopter Canada are all headquartered there. Quebec is also a leader in advanced manufacturing and is home to TEKNA Plasma Systems Inc., which produces innovative metallic powders used in 3D printing and electronic products.²⁴

New Brunswick, Newfoundland, Labrador, and Nova Scotia are heavily reliant on seafood production and

food processing. Nova Scotia, where 40% of Canada’s military assets are located,²⁵ is also an important center for aerospace and defense manufacturing (space vehicles, missiles) as well as ship and boat building. Lockheed Martin, Pratt & Whitney, and General Dynamics each have a significant presence in the province.

A 2018 *Plant Magazine* survey²⁶ of nearly 500 senior manufacturing executives, most with small businesses (100 or fewer employees) but including firms of all sizes, shows manufacturers broadly optimistic, but slightly less so through 2020 because of slowing domestic and global demand growth as well as US tax and trade policies (see Chapter 2). Businesses said they planned to invest an average of 5% of their budgets on innovation in 2018, mainly in products, processes, technology, and customer experience.

EXHIBIT 6

Across Canada’s six major manufacturing provinces, industry activity breaks down as follows.

Province	Top Manufacturing Industries	% of Provincial Workforce
Alberta	Mining / oil & gas machinery	9.5
	Meat, beef & poultry processing	6.4
	Wood paneling	4.3
British Columbia	Sawmills / wood products	9.7
	Meat, beef & poultry processing	4.6
	Wood paneling	3.0
Manitoba	Meat, beef & poultry processing	13.4
	Tractors & agricultural machinery	6.9
	Printing	5.2
Ontario	Automotive	4.9
	Plastics products	4.2
	Printing	3.4
Quebec	Aerospace	6.5
	Meat, beef & poultry processing	3.6
	Plastics products	3.1
Saskatchewan	Tractors & agricultural machinery	18.7
	Meat, beef & poultry processing	7.8
	Truck, trailer & home manufacturing	5.0

Source: CanadianVisa.org

Energy

Canada is the world's sixth largest energy producer, fifth largest net exporter, and eighth largest consumer. Canada's energy sector contributed C\$213 billion—almost 11%—to nominal GDP in 2017, directly employing more than 276,000 people and indirectly supporting another 624,000 jobs, according to Natural Resources Canada. The federal and provincial governments together spent more than C\$650 million on energy research, development, and deployment in 2016–2017, with another C\$1.6 billion spent by industry.²⁷

Energy production is concentrated in three provinces: British Columbia, with significant deposits of oil, natural gas and coal; Alberta, the largest provincial producer with abundant reserves of oil sands, natural gas, and natural gas liquids; and Saskatchewan, a major uranium and oil producer. British Columbia, Manitoba, Ontario, Quebec, and Newfoundland and Labrador all generate significant hydroelectric power, some for export. Nuclear power, representing 15% of Canada's electricity output in 2016, is produced by four operational plants in two provinces, Ontario and New Brunswick.²⁸ Energy accounted for 22% of Canada's exports and 7% of

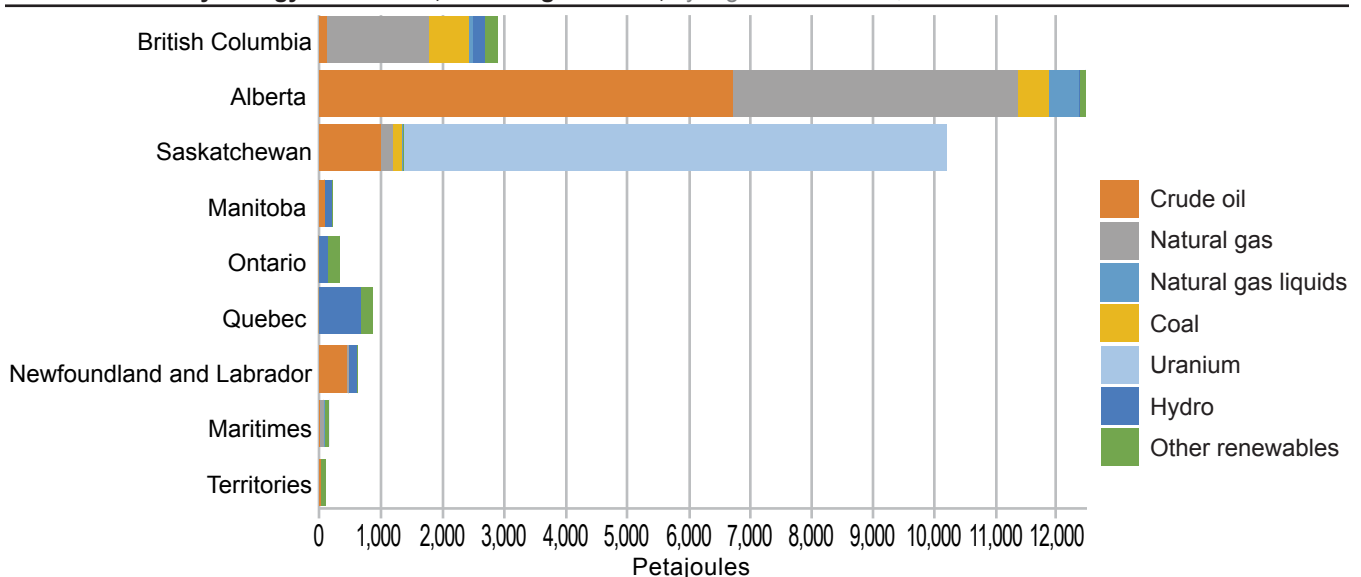
imports in 2017; the US bought 91% of Canada's energy exports and supplied 65% of its energy imports (see Chapter 2 for more details).²⁹

Like other commodities, energy markets have been volatile, impacting Canadian investment and production. Annual capital expenditures in the energy sector more than doubled from 2009 to 2014—from C\$54 billion to C\$117 billion, as crude oil prices rose.³⁰ Oil sands oil is relatively heavy and dirty, costly to extract, and more difficult to transport through pipelines and commands a lower price than lighter West Texas Intermediary crude. Improvements to hydraulic fracking and horizontal drilling further enabled US producers in the Permian Basin in Texas and New Mexico to access stacked layers of tight oil more quickly and economically, at crude prices as low as \$40 per barrel. In Canada, legal and bureaucratic challenges from environmental and indigenous community interests have so far delayed or led to cancellation of five pipeline projects critical to transporting oil from Alberta to refineries and export markets via the Pacific or Atlantic coasts, the US Gulf, or the Great Lakes.

EXHIBIT 7

Canada's energy production is concentrated in British Columbia, Alberta, and Saskatchewan.

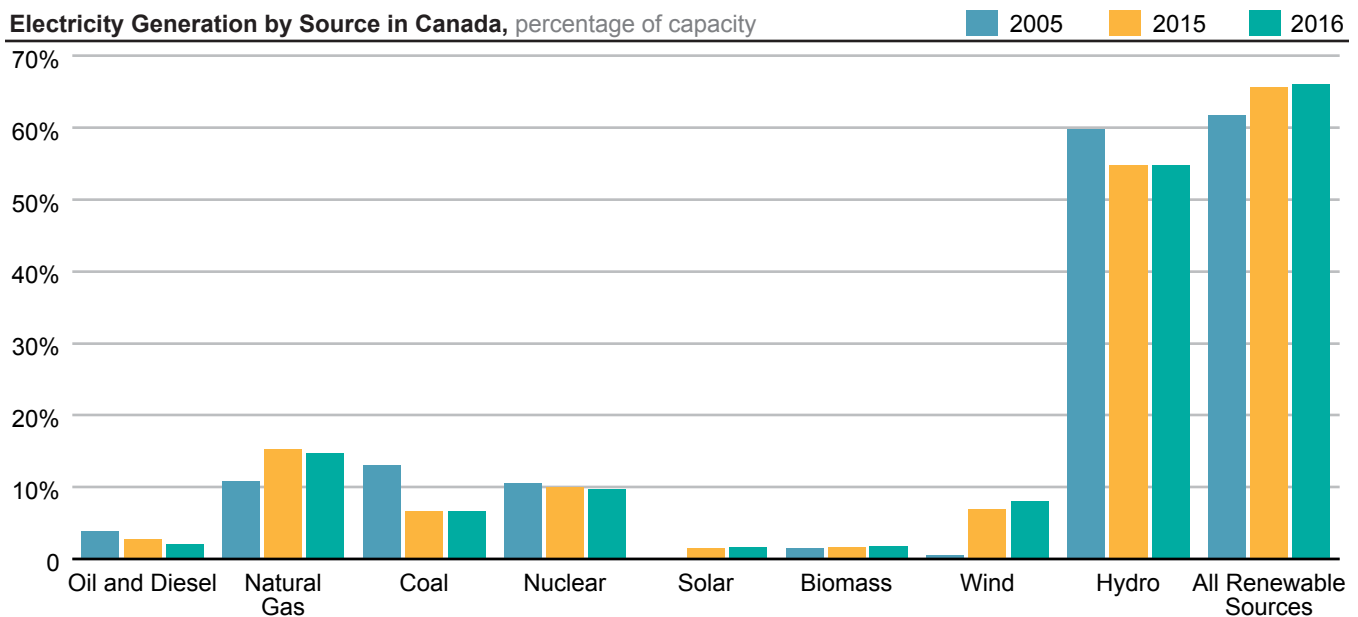
Canadian Primary Energy Production, Including Uranium, by region and source, 2018



Source: Natural Resources Canada

EXHIBIT 8

Hydropower accounts for well over half of Canada’s domestic electricity generation, and wind is the fastest growing renewables segment.



Source: National Energy Board, Government of Canada

Lower US corporate tax rates and relaxed regulation of exploration and drilling have accelerated the trend, even more so given the level of integration in the US and Canadian markets. The Canadian Association of Petroleum Producers forecast for 2018 capital spending in Canada’s oil and gas industry was C\$41 billion, a decline of nearly a half compared to the C\$81 billion spent in 2014.³¹ Shale and ‘tight’ oil and gas reserves—the former found among compressed layers of shale, the latter within porous limestone or sandstone—are a small but growing segment of the market in Canada, concentrated primarily in Alberta and British Columbia. Shale oil is currently only 8% of production in Canada—335,000 barrels per day—but two formations are believed to contain 4.5 billion barrels of oil, 20 billion barrels of natural gas liquids, and 500 trillion cubic feet of natural gas, according to the National Energy Board (NEB). By 2035, NEB predicts that shale and tight reserves could be the source of 80% of Canada’s natural gas production.³²

Canada has ample infrastructure in place to both produce and transport natural gas to market. In 2017, Canada exported just over half of its natural gas output to the US. As those exports have declined over time as the US nears self-sufficiency, producers have increased

their focus on liquefied natural gas (LNG) exports. As of December 2018, National Resources Canada reports that 18 LNG export facilities have been proposed in Canada—13 in British Columbia, 2 in Quebec, and 3 in Nova Scotia—with a total proposed export capacity of 216 million tons per annum (mtpa). At present, however, Canada has only one operational LNG terminal—an import terminal—in Saint John, New Brunswick.³³

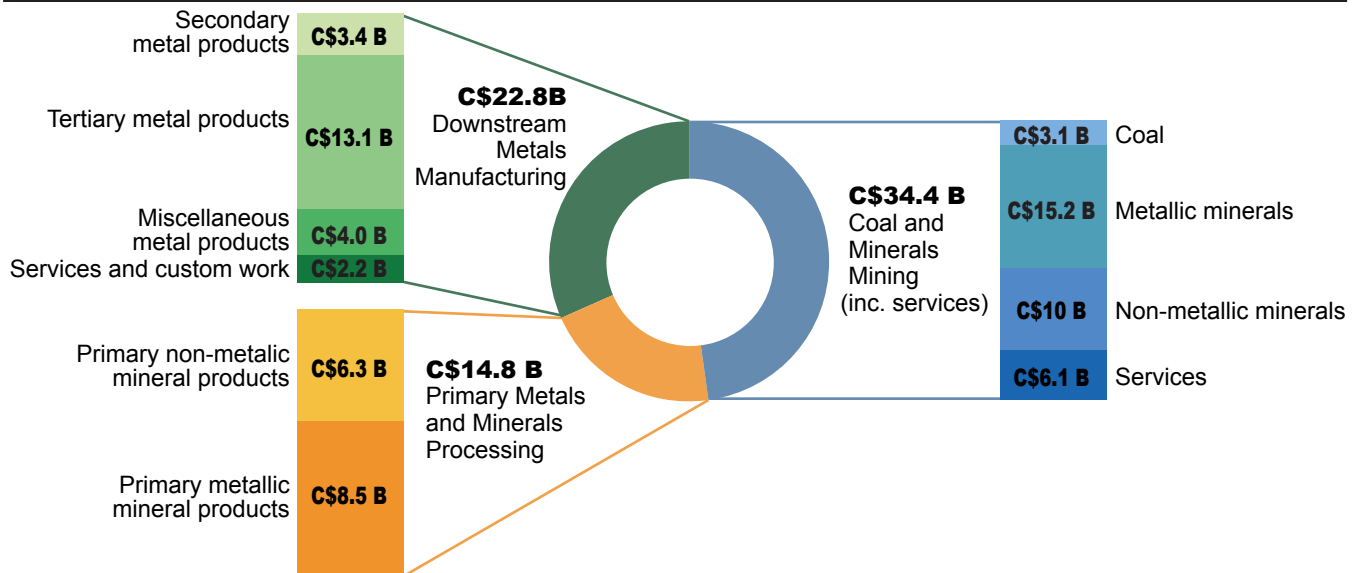
LNG Canada, a new C\$40 billion (US\$31 billion) mega-terminal project led by Royal Dutch Shell, was approved in October 2018. The facility, in northwest British Columbia, will begin operating before 2025, serving the Asian market. LNG Canada predicts that global LNG demand will double by 2035, with much of that demand coming from Asia. Canada offers a much shorter transit time to market compared to new projects underway in the US.³⁴

A 2016 Conference Board of Canada study estimated that development of an LNG export industry equivalent to 30 mtpa in British Columbia could add roughly C\$7.4 billion annually to Canada’s economy over the next 30 years and raise national employment by an annual average of 65,000 jobs.³⁵

EXHIBIT 9

In 2017, Canada's minerals sector directly added C\$72 billion to the economy—representing 3.6% of GDP.

Canada 2017 Minerals Sector Nominal GDP, by subsector and product group



Source: Natural Resources Canada

A Renewable Future?

More than 17% of Canada's domestically generated total energy supply comes from renewable sources, exceeding the global average of about 13%. Canada is the world's seventh largest producer of energy from renewables, primarily hydropower and wood biomass, mainly from forest products waste used in cogeneration. It generates 10% of the world's hydroelectric power, second only to China.³⁶

Hydropower accounts for a disproportionate share of Canada's domestic electricity generation—averaging 59.6% of total generation from 2005 to 2016. Renewables, including hydro, together generate 66%. Along with nuclear power, Canada is able to boast that more than 80% of its electricity generation emits zero greenhouse gas emissions.³⁷

Wind is the fastest growing renewables segment, but averages just over 5% of production with 12,000 megawatts (MW) of installed capacity, concentrated in Ontario, Quebec, Alberta, British Columbia, and Nova Scotia.³⁸ Solar installed capacity is less than 3,000 MW, nearly all in Ontario. Solar capacity, however, is

understated in most data, which do not track distributed residential and business rooftop generation. It is worth noting that over 2005–2016, the non-hydro renewables share of Canada's electricity supply—wind, solar, and biomass, grew nearly five-fold, from 1.5% to 7.2%, while coal's share fell from 16.1% to 9.3%.³⁹

Tax incentives and other government subsidies tied to sustainability and climate change goals have made renewables cost-competitive with most fossil fuels, especially when crude prices are high. In January 2018, Natural Resources Canada (NRC) launched a C\$200 million Emerging Renewable Power Program, to award grants toward development of commercially proven, utility-scale offshore wind, geothermal, photovoltaic, or tidal energy projects.⁴⁰ NRC is in the process of identifying six eligible projects, the first being a 9-MW tidal energy project in the Bay of Fundy being developed by Irish firm DP Energy, which announced the receipt of a C\$29.75 million (US\$23 million) NRC grant in September 2018.⁴¹

To address climate change, Canada pledged in 2015 to reduce its annual CO₂-equivalent emissions from 722 million megatons to 517 million by 2030.⁴² Strategy to date has involved further shifting electricity

generation from coal to renewables, shifting energy-intensive industries like cement and metal fabrication to cleaner natural gas, and reforestation to naturally capture and store CO₂ emissions. A December 2017 OECD report lauded these efforts but noted a recent slowing trend in overall emissions reductions and called on Canada—the OECD’s fourth largest emitter—to take further steps.⁴³

Mining

In 2017, Canada’s minerals sector directly added C\$72 billion to the economy—representing 3.6% of GDP—plus another C\$24.5 billion in related services and other indirect benefits. The sector breaks out into three parts: coal and minerals mining, primary metals and minerals processing, and downstream metals manufacturing. Along with transportation and other related support services, these directly and indirectly employ a nationwide workforce of 634,000.⁴⁴

Canada is the world’s top producer of potash, and among the top five sources for gold, copper, iron ore, nickel, diamonds, and coal. It is the second largest producer of uranium after Kazakhstan and the third largest aluminum producer after China and Russia. Six of the top 40 global mining companies—Potash Corp., Barrick Gold, Teck Resources, Goldcorp, Agnico-Eagle Mines, and First Quantum Minerals—are based in Canada. Canadian mineral production in 2017 had a combined value of C\$43.9 billion, up 11.3% from C\$39.4 billion in 2016.⁴⁵ Minerals make up half of the country’s total rail freight tonnage.

The Toronto Stock Exchange (TSX) and TSX Venture Exchange (TSXV) list some 1,200 issuers engaged in mining and mineral exploration, representing almost half of the global listings total in 2017. Listed companies raised a combined C\$8.5 billion in equity financing, accounting for 30% of the total mining capital raised globally. Canada ran a C\$19.9 billion trade surplus in minerals for 2017, according to Natural Resources Canada data; 53% of its C\$97.5 billion in minerals exports was shipped to the US.⁴⁶

Technology plays a growing role in helping miners with more precise resource planning and managing

safety and business risks. Teck Resources has partnered with Canadian startup LlamaZOO on a virtual reality simulator, MineLife VR, that analyzes a mine’s life cycle and tests future scenarios. Goldcorp is using IBM’s Watson to more accurately predict the location and size of ore deposits in its Red Lake Mine and, down the road, process company data to identify merger and acquisition opportunities. Use of drones and robotics has become more common in inspections and performing hazardous drilling or blasting work.

Financial Services

Financial services account for more than 7% of Canadian GDP, employing 4.5% of the workforce, some 800,000 people—up more than 11.6% since 2007.⁴⁷ A third of industry jobs are concentrated in Toronto.⁴⁸

A November 2017 Conference Board of Canada report on the industry noted the sector’s importance to small and mid-sized businesses in Canada, providing \$21 billion in private equity and venture investment, and \$243 billion in available credit at the end of 2016, the latest point for which data is available.⁴⁹ Finance was the leading source of Canadian outbound foreign direct investment, at C\$537 billion—48% of the nation’s total outbound FDI—in 2017.⁵⁰ Three Canadian insurers—Manulife Financial, Great-West Lifeco, and Sun Life Financial Inc.—are among the world’s 20 largest life insurance firms;⁵¹ 140 Canadian hedge-fund management companies manage over C\$35 billion in assets.⁵²

The Brave New World of Finance

Most traditional financial institutions came out of the 2008 financial crisis highly capitalized, less leveraged, and more risk averse. Many households and small or new businesses found themselves closed off to formal lending sources due to insufficient credit histories or lack of collateral. Half of Canadian SMEs raise working capital or borrow to expand their businesses through personal savings, loans from family or friends, personal loans, or credit cards, according to Canada’s Competition Bureau. Fintech firms have stepped in to fill the gap with peer-to-peer (P2P) lending platforms that match individual borrowers and lenders online,

and equity crowdsourcing that allows SMEs to pitch their business plans to pools of investors. Canada's Department of Finance and Payments Canada, the organization that operates and oversees national payment systems, are in the process of building a framework to integrate new products and services into the broader economy, with the goal of ensuring security, privacy, and consumer protections, but without unduly constraining innovation or competition. The Competition Bureau has offered guidance on new regulations, recommending that they be

- technology-neutral and revenue-agnostic;
- principles-based, to allow flexibility as demand and technology change;
- based on function, not type of provider, to assure parity and consumer protections;

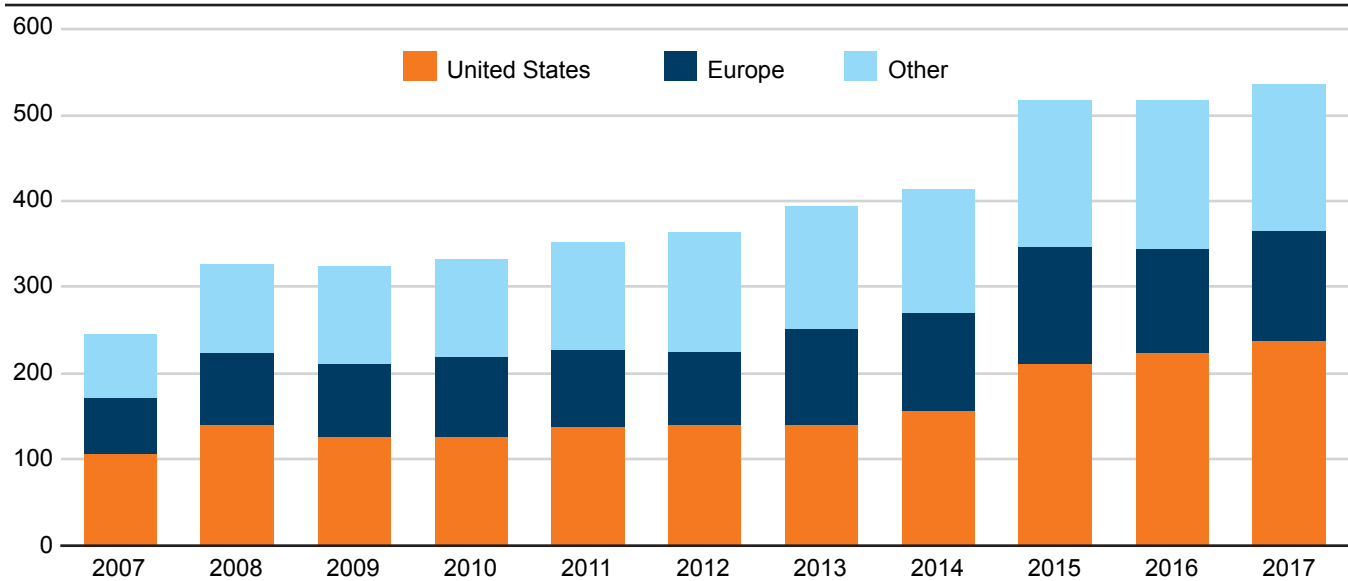
- proportional to the risks that the regulation is intended to govern;
- harmonized across provincial and other jurisdictions;
- placed under a clear, unified lead agency for fintech regulation;
- structured to encourage collaboration throughout the sector and provide access to core infrastructure, core PSP services, and consumers' data with appropriate safeguards; and
- reviewed and adapted on an ongoing basis to meet evolving market conditions.

As in many markets where fintech adoption is underway, there is ample incentive for partnerships, as tech-focused startups bring forward new ways to reach new customers, facilitate payments, and analyze borrowing patterns at a more granular level in order to manage risk and offer more customized services.

EXHIBIT 10

Canadian financial services institutions' stock of foreign direct investment reached a new high of C\$537 billion in 2017, more than doubling since 2007, with the US as the primary market for financial services exports.

Canadian Financial Services Direct Investment Abroad, C\$ billions



Source: Statistics Canada, Table 36-10-0009-01; The Conference Board of Canada





Trade: Integrated Markets

Key Takeaways:

- Canada has consistently been the largest global market for US goods exports.
- While the US runs a small goods trade deficit with Canada, it runs a net surplus due to high-value services and technology exports.
- A large share of US-Canada trade is complementary, in part due to bilateral trade agreements spanning three decades.
- Canada is California's second largest trading partner, after Mexico.
- Canada is an important supplier of natural gas and hydroelectric power to California utilities and industrial customers; California buys roughly 75% of British Columbia's hydropower exports to the Western US.
- California exports mainly electronic (computing, audio-visual, telecommunications, optical, medical) equipment and agricultural commodities to Canada—much of them from Bay Area counties—and in turn buys vehicles, energy, meat, seafood, plastics, and wood products.
- More than half of California's services exports to Canada are technology-related—including business, professional & technical services, telecommunications, and royalties/licenses—with the remainder mainly in travel/tourism and financial services.
- On the whole, California has been little affected by recent tariff frictions and the renegotiation of NAFTA; California wineries won concessions on retail display; California lumber producers have benefitted from tariffs, but higher lumber prices could add to California's already high construction costs. The US withdrawal from the Trans-Pacific Partnership (TPP) and non-participation in its successor agreement—the Comprehensive and Progressive Agreement for Trans-Pacific Partnership—is likely, however, to make California and other US exports less competitive with Canadian products in Asia-Pacific markets such as Japan.

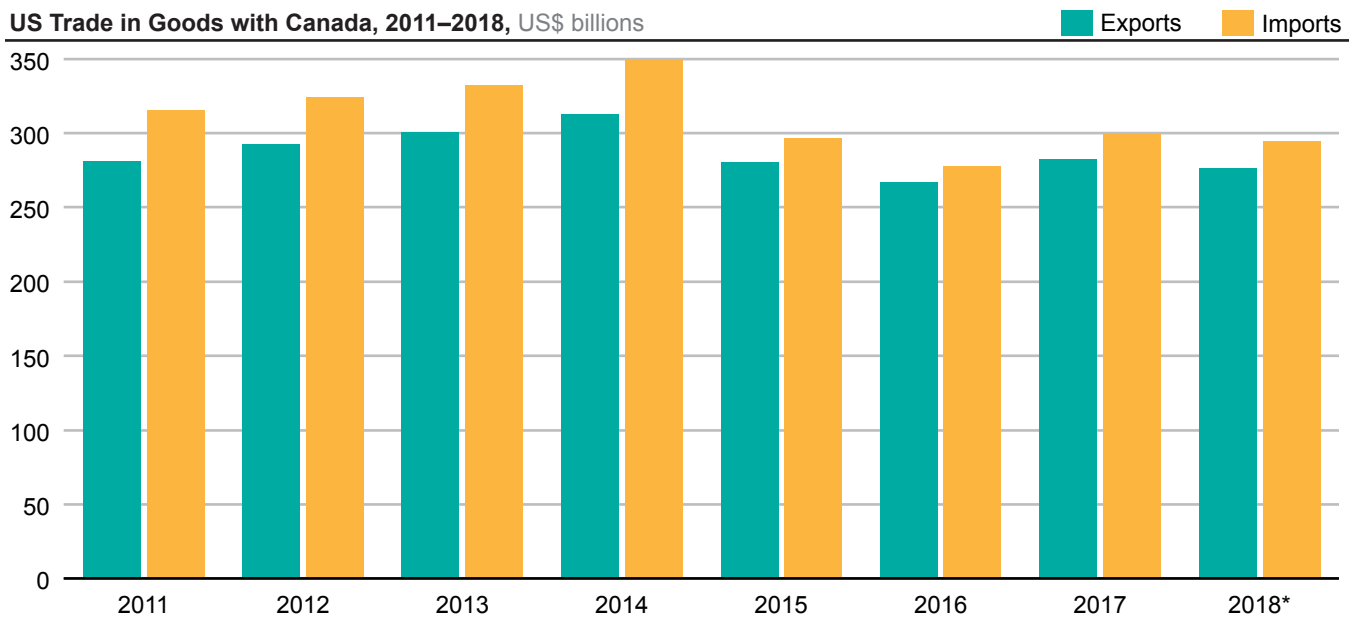
Despite recent headlines proclaiming turmoil in the US-Canada trade relationship, conflicts primarily relate to longstanding disputes in a small number of sectors which, at least for now, have been largely addressed through negotiated settlement.

Through it all, trade between the two countries has remained stable, with the normal ebb and flow reflecting broad economic trends. Trade overall is in balance. The US runs a slight historic goods trade deficit with Canada, partially offset by a small surplus in services trade. Canada has long been the largest worldwide market for US goods and trades places with Mexico as either the second or third largest exporter to the US behind China. Over time, Canada has consistently accounted for 12–15% of US goods imports and 18–19% of US goods exports.¹

EXHIBIT 11

US trade with Canada has remained stable, with the normal ebb and flow reflecting broad economic trends. Trade overall is in balance.

US Trade in Goods with Canada, 2011–2018, US\$ billions

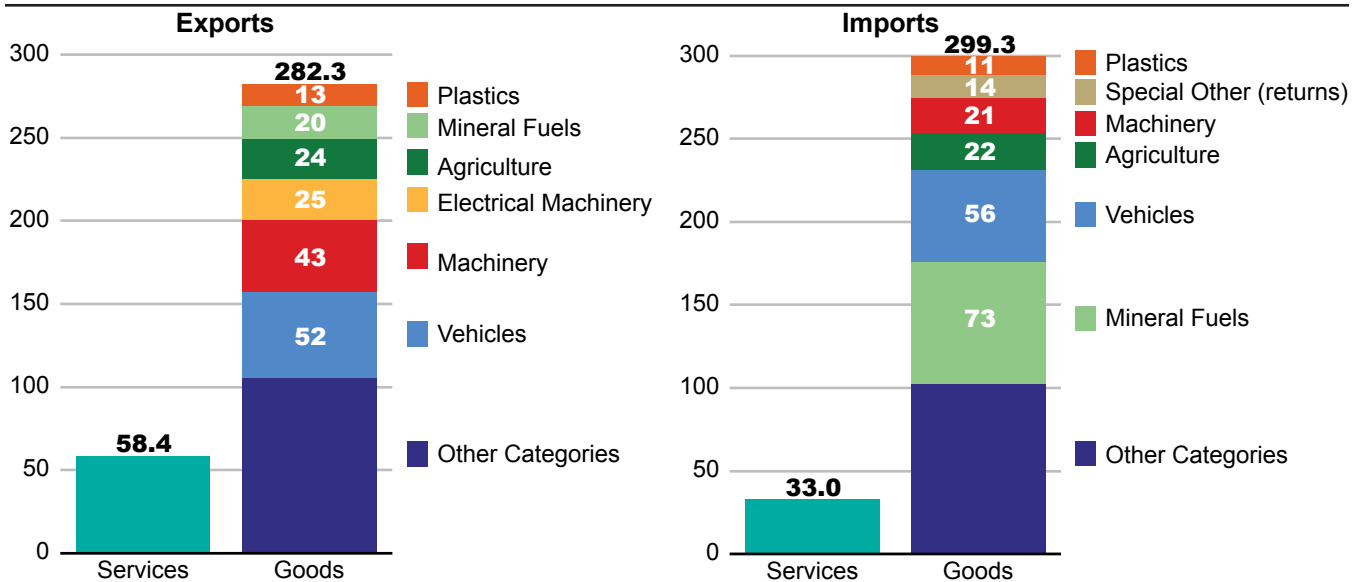


Source: US Census Bureau. *2018 data Jan–Nov YTD.

EXHIBIT 12

Two-way US-Canada goods and services trade in 2017 totaled US\$673 billion; goods accounted for nearly \$582 billion and services made up more than \$91 billion.

US Goods and Services Trade with Canada in 2017, US\$ billions



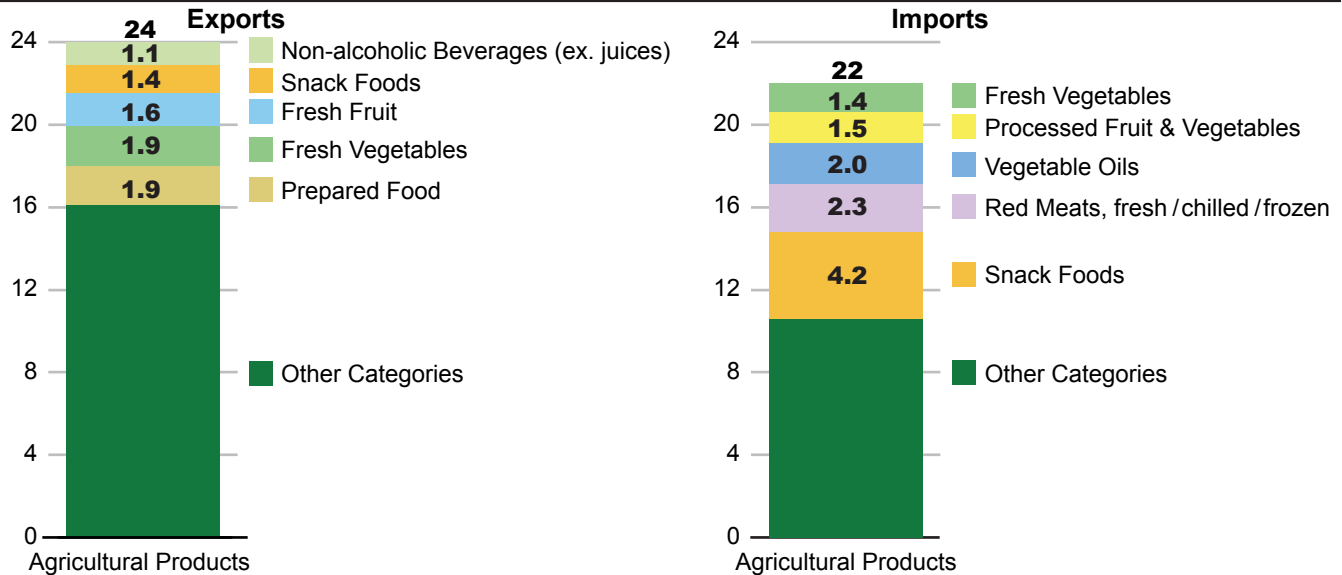
Source: US Trade Representative

Visualization: Bay Area Council Economic Institute

EXHIBIT 13

Canada is the largest export market for US agricultural products and is the second largest supplier of US agricultural imports.

US Agricultural Trade with Canada in 2017, US\$ billions



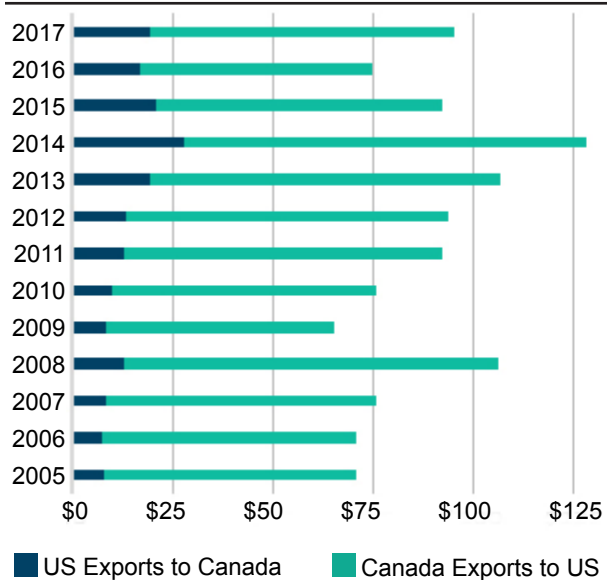
Source: US Trade Representative

Visualization: Bay Area Council Economic Institute

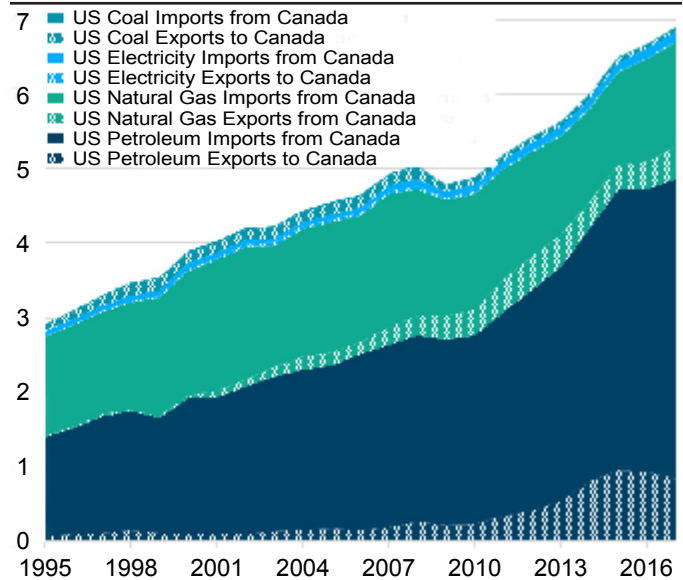
EXHIBIT 14

The volume of energy trade has risen steadily, except during the global recession, though the value of trade has risen and fallen with commodity prices, particularly crude oil.

Value of US-Canada Energy Trade, US\$ billions



Volumes of US-Canada Energy Trade, Mboe/d*



Source: Statistics Canada for value; US Energy Information Administration for volumes; *Mboe/d = Million barrels of oil equivalent per day

Two-way US-Canada goods and services trade in 2017 totaled US\$673 billion, according to data from the US Trade Representative. Goods accounted for nearly \$582 billion and services made up more than \$91 billion. The US ran a \$17 billion deficit in goods, with \$299 billion in imports versus \$282 billion in exports. In services, by contrast, the US ran a \$25 billion surplus, with \$33 billion in imports and \$58 billion in exports.²

The leading US services exports to Canada in 2017 were travel and tourism, intellectual property (computing, software, audio visual), and professional/management services. The leading services imports from Canada were travel and tourism, telecommunications, computing, and information services. World Trade Organization figures for 2017 show that the US was Canada's largest global commercial services trading partner in both imports and exports.³

A Thriving, Interdependent Energy Market

The US and Canada together compose a US\$95 billion energy market that extends beyond simply a trade relationship into economic, strategic, and environmental policy areas that are most often cooperative but at times can be contentious.

Canada enjoys a significant trade surplus with the US in energy commodities—crude oil, refined petroleum products, natural gas, electricity, coal, uranium, and fuel ethanol. A May 2018 study by the Center for Strategic and International Studies (CSIS) and the Embassy of Canada, mapping the bilateral energy relationship, shows that Canada's 2017 energy commodity exports to the US totaled more than US\$75 billion, against imports from the US of nearly US\$20 billion. This trade encompasses almost 4.9 million barrels of crude oil and petroleum products and 10.6 billion cubic feet of natural gas traded daily, plus 82 terawatt hours (TW/h) of electricity transmitted annually, across a network of 70 pipelines and 34 transmission points. The volume of energy trade has risen steadily, except during the global recession, though the value has risen and fallen with commodity prices, particularly crude oil.⁴

Canadian electricity sales accounted for only 2% of US retail sales in 2017, but provided an important

source for reliable backup power for regional grids, particularly in northern US states. California's role in this trade is relatively small—around \$1.5 billion annually. The state imports crude oil and ships back refined fuels and petroleum products; utility and industrial users buy natural gas and hydroelectricity. California buys roughly 75% of the nearly 15 TW/h in hydropower that British Columbia exports into the western US.⁵

California and the Bay Area

California's two-way trade in goods with Canada topped US\$45.5 billion in 2017, up from \$44 billion in 2016; this included \$16.8 billion in California exports to Canada and \$28.7 billion in imports from Canada.⁶ This made Canada the second largest global trading partner for California, behind Mexico and just ahead of China. Foreign trade data from the US Census Bureau for January–August 2018 showed a total of \$39.8 billion, suggesting solid growth for the year.⁷ The California Chamber of Commerce reports that two-way US-Canada trade and investment supports close to 1.2 million jobs in California.⁸

California exports mainly electronic (computing, audio-visual, telecommunications, optical, medical) equipment and agricultural commodities to Canada—much of them from Bay Area counties—and in turn buys vehicles, energy, meat, seafood, plastics, and wood products.

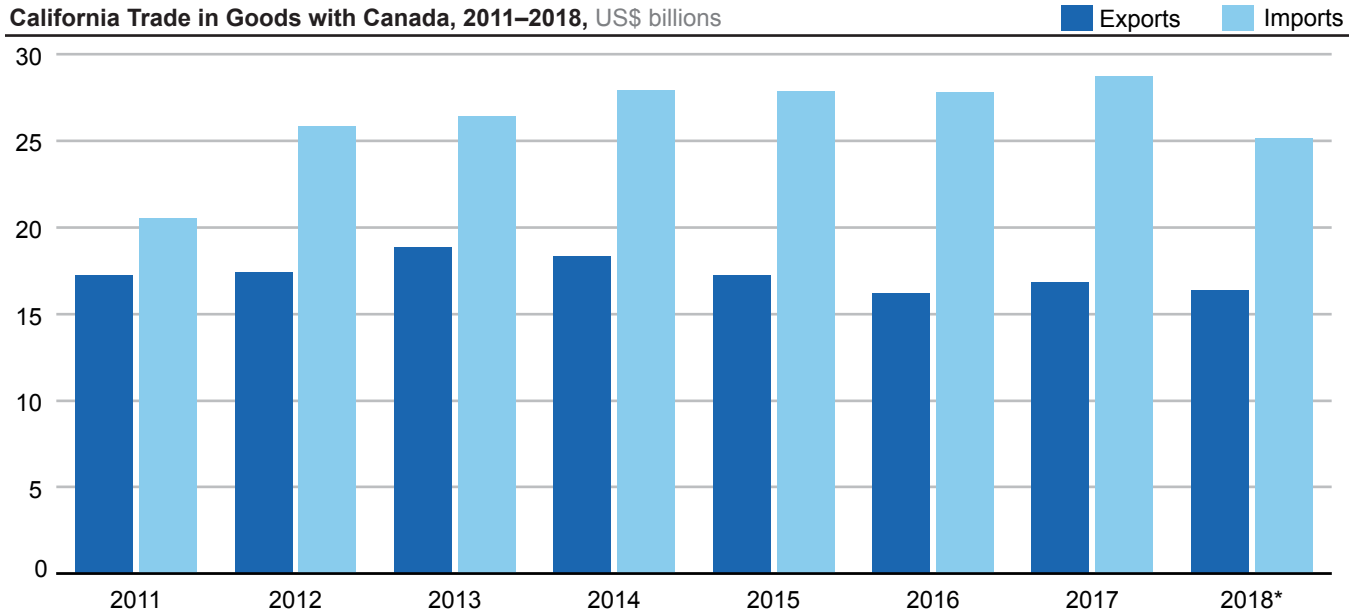
More than half of California's services exports to Canada are technology-related—including business, professional & technical, telecommunications, and royalties/licenses—with the remainder mainly in travel/tourism and financial services. California exported US\$9.4 billion in services to Canada in 2017, according to Government of Canada state trade data, including

- business, professional & technical services (\$1.8 billion);
- telecommunications (\$904 million);
- royalties/licenses (\$2.5 billion);
- travel/tourism (\$2.6 billion); and
- financial services (\$736 million).

Some 2 million Canadians visited California in 2017 for business and family visits or on vacation, spending \$1.5 billion. About 1 million Californians visited Canada, spending an estimated \$759 million.⁹

EXHIBIT 15

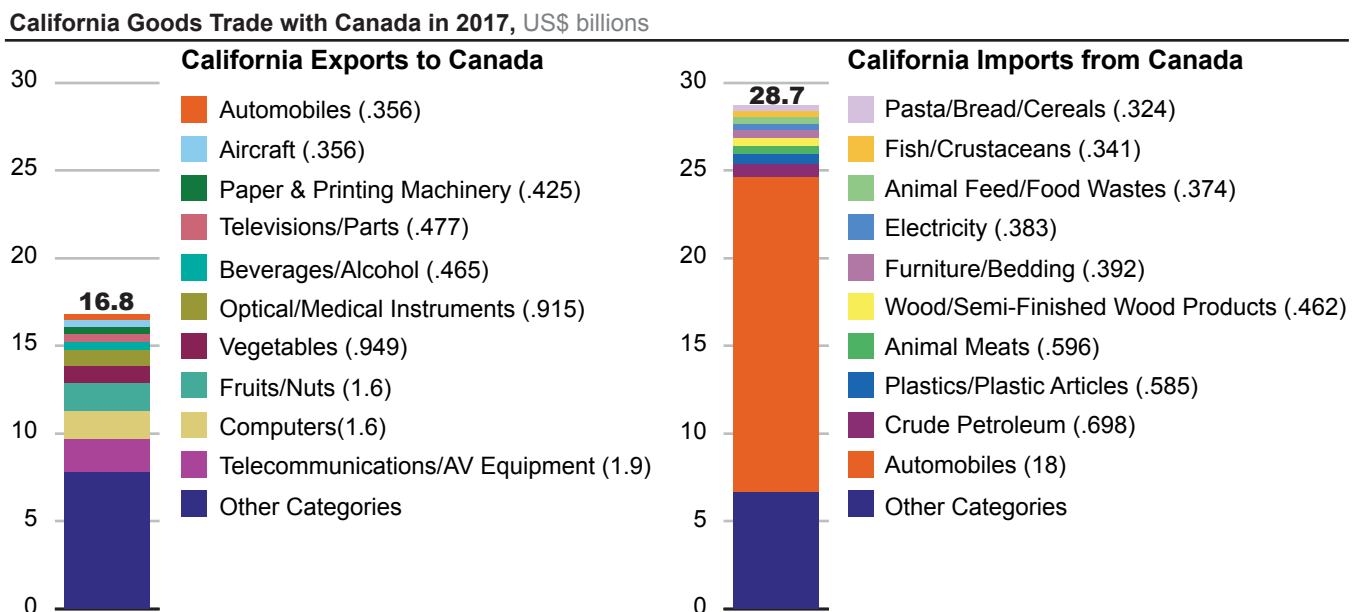
California's two-way trade in goods with Canada topped US\$45.5 billion in 2017; this included \$16.8 billion in California exports to Canada and \$28.7 billion in imports from Canada.



Source: US Census Bureau. *2018 data Jan–Nov YTD.

EXHIBIT 16

Canada is the second largest global trading partner for California, behind Mexico and just ahead of China.



Source: Government of Canada

Growing Air Links

Growth in business and research activity as well as tourism is reflected in growing air travel between the Bay Area and Canada—activity that is supported by an expanding service network. Air Canada, the largest carrier between the Bay Area and Canada, provides daily nonstop service between San Francisco (SFO) and Toronto, Montreal, Vancouver, and Calgary, with direct service to Edmonton added in 2018. Air Canada also has direct flights from San Jose (SJC) to Toronto, and in 2018 added direct service between Sacramento and Vancouver. Year-on-year, its passenger count to and from the Bay Area has grown by more than 10%, making Northern California one of the airline’s most important trans-border markets. The Air Canada passenger count on routes to all Canadian cities with direct service has grown, led by Toronto.¹⁰ Canadian low-fare carrier Westjet also provides direct service between San Francisco and Vancouver and Calgary.

Trade Friction Fallout

As noted previously, US-Canada trade is roughly in balance. The US overall goods and services trade surplus with Canada was \$8.4 billion in 2017. In terms of goods trade alone, the US had a \$17.4 billion deficit with Canada, but it was offset by a US surplus in services trade.¹¹ Overall, the US exports 94 cents in goods or services for every dollar of imports from Canada. In contrast, the US deficit with the rest of the world averages 62 cents in exports per dollar of imports, including 77 cents per import dollar for Mexico and only 26 cents per import dollar for China.¹²

In automobiles and food, the US sells \$1.01 to Canada for every import dollar it spends. While automotive trade is historically complicated by cross-border co-production under the North America Free Trade Agreement (NAFTA), a simplified characterization is that the US sells Canada as much in parts and subassemblies as Canada ships back in assembled vehicles. A US deficit in raw materials such as shale oil, forest products, and metals—55 cents in exports for every dollar of imports—is largely due to Canada’s rich endowment in natural resources

and its much smaller population and domestic market. In production manufacturing and machinery, however—computers, industrial robots, farm machinery, mining, and warehouse equipment—the US enjoys a surplus of \$2.05 in exports per dollar of imports. In consumer goods, from clothing and furniture to cell phones, the surplus is \$2.26 per dollar of imports.¹³

A small number of lingering, historic goods trade disputes have marked the US-Canada trade relationship over time. Among the disputed categories are softwood lumber, dairy, wine, aircraft, and cultural industries.

- **Softwood lumber:** Since 1982, US producers of softwood lumber used for residential construction and newsprint have claimed that artificially low “stumpage fees” paid to harvest Canadian timber on mostly public lands result in lumber exports at below-market prices. Canada argues that the fees are comparable when taking into account the two countries’ different measures for board lengths and tree yields. After multiple rounds of tariffs, challenges, and conflicting rulings, a 2006 Softwood Lumber Agreement (SLA) replaced US tariffs with Canadian export taxes and quotas but expired in 2015. Nearly 70% of Canadian softwood lumber exports go to the US, which imported \$5.7 billion worth of Canadian lumber in 2016.¹⁴
- **Dairy:** Canada’s 11,000 dairy farms operate under a “supply management” system (SMS) that allocates production, sets prices, and imposes high tariffs on imports above threshold levels, including a 270% tariff on milk. The SMS is codified in NAFTA, but does not cover “ultrafiltered milk” products (concentrates used to make cheese, infant formula, and yogurt); US producers sold \$133 million worth, duty-free, in 2016, but export sales have fallen as Canadian producers have since lobbied regulators to bring ultrafiltered milk under SMS. US industry, meanwhile, faces a domestic dairy glut and falling milk prices.¹⁵
- **Wine:** Wine is sold in Canada mainly through government-run liquor stores, although in 2015 British Columbia began to allow the sale of liquor and domestically produced wine in grocery stores.¹⁶

Canada is California's leading wine export market, buying \$444 million worth in 2017; imports account for 70% of wine sales in Canada. Because the British Columbia regulations limited grocery store shelf access to domestic wines, the only way for those stores to sell imported wines was by creating a "store-within-a-store" with controlled access and a separate cash register. British Columbia, Ontario, and Quebec also offer domestic wines preferential treatment through local bottling requirements, excise tax discounts, and other means. Argentina, Chile, Mexico, New Zealand, the European Union and the United States have jointly complained to the government of British Columbia, and Australia has lodged a complaint with the WTO.¹⁷

- **Aircraft:** In 2016, Delta Airlines agreed to purchase 75 CS-100 jets from Montreal-based manufacturer Bombardier, for \$5 billion.¹⁸ Bombardier, facing delays and cost overruns after a \$6 billion investment in the new narrow-body jet, received a federal-provincial rescue package of more than US\$1 billion to complete the sale. Boeing, a competing bidder, claimed injury because the government rescue amounted to a subsidy. Bombardier objected, noting that Boeing's bid was based on providing secondhand jets manufactured by another company. The US Commerce Department agreed, imposing a 300% duty on each plane when delivered.¹⁹ The US International Trade Commission, which must also sign off for the duties to be imposed, sided with Bombardier in January 2018, striking down the 300% tariff and ending the dispute.²⁰
- **Cultural industries:** Canada has vigorously fought to preserve a space for uniquely Canadian arts, information, and entertainment that is not only domestically produced but reflects Canadian identity. The concern was both competitive and cultural; mass market foreign media had the capacity to flood a relatively small Canadian market, draining sales and advertising revenue and dominating distribution channels for domestic arts and media. Both the Canada-United States Free Trade Agreement (CUSFTA) and NAFTA exempted cultural trade from free trade rules, but they were

superseded in 1997 by a WTO ruling against an 80% Canadian excise tax on a "split-run" (containing Canadian advertising but US editorial content) Canadian edition of *Sports Illustrated*.²¹ The WTO ruled that, for purposes of trade, "like products" cannot be differentiated culturally—a judgment which extended to book and music store chains, television programming, and films—leaving Canada with only a ban on foreign ownership of media outlets that continues to be challenged.

The Trump Administration took office in January 2017 with a trade agenda from the 2016 campaign, focused on (1) reversing goods trade deficits believed to have, over decades, hollowed out manufacturing sectors, local economies in regions of the country, and blue-collar jobs, to the detriment of US economic security; (2) imposing tariffs and quotas to force negotiation across a full range of often unrelated trade issues; and (3) rejecting multilateral trade agreements and institutions in favor of bilateral negotiation, in order to leverage the size and depth of the US market to achieve more favorable trade terms.

With the exception of wine and cultural exports, California has less exposure to goods trade frictions with Canada than the US as a whole, since services and technology dominate the California-Canada trade relationship. Nonetheless, the US imposition of tariffs on steel and aluminum imports and subsequent Canadian retaliation, and the US move to renegotiate NAFTA, have had ripple effects across California's economy.

On June 1, 2018, the US imposed global tariffs of 25% on imported steel and 10% on imported aluminum,²² later carving out exceptions for various countries and products as considered warranted. The tariffs were imposed on national security grounds, circumventing WTO review. Initial exceptions created for Canada and Mexico were revoked to apply pressure toward talks to re-open NAFTA.²³

Given the close integration of the US and Canadian steel and aluminum markets, this has complicated North American supply chains and constrained potential benefits from the recently negotiated US-Mexico-Canada Agreement (USMCA). Canada buys half of

all US steel exports and sells the US 84% of its total aluminum production. Annual two-way trade totals \$14 billion for steel and more than \$11 billion for aluminum; the US has a surplus in steel trade of \$2 billion.

Canada retaliated in July 2018 with tariffs on C\$16.6 billion in US products, an equivalent value to its affected exports. It applied 25% tariffs to various types of steel and 10% tariffs on aluminum products and on a range of consumer goods, from water heaters and dishwashers to plywood and paper products to soy sauce and ketchup.²⁴ The tariffs in both directions add costs for California businesses and consumers, and for businesses selling into Canada.

The US-Mexico-Canada Agreement was adopted in September 2018, promising several key changes²⁵ in US-Canada trade:

- **Review clause:** The USMCA includes a 16-year expiration date and a provision that requires a review of the deal every six years, when it can be extended.
- **Dispute settlement:** The existing NAFTA dispute-settlement system for resolving complaints of unfair trade practices remains in place, a win for Canada; an investor-state dispute-settlement system will be phased out.
- **Dairy:** US producers will have access to the equivalent of 3.6% of Canada's dairy market, up from the existing level of 1%. Canada will eliminate preferential pricing for ultrafiltered milk and other products in the Canadian market.
- **Agriculture/wine:** US poultry and egg exporters will have improved access to the Canadian market; imported and domestic wines will receive equal treatment in BC grocery stores.
- **Auto rules:** Members must produce 75% of a car's components versus the current 62.5% in order to qualify for duty-free treatment; 40% of each car must be produced by workers making \$16 an hour or more to avoid duties. Canada is allowed to ship 2.6 million cars and \$32 billion in car parts to the US without tariffs. (Current exports are well below those levels.)

- **Exchange rates:** Countries will not intervene to strengthen or weaken their currencies.

- **Increased protections for intellectual property:** Copyrights are extended to 70 years after the creator's death (up from 50 years); the period of patent exclusivity for pharmaceuticals is raised from 8 years to 10 years before generics can be introduced.

Even with the USMCA negotiated, US steel and aluminum tariffs remain in place, pending ratification by Congress and US industry achieving sustained capacity utilization targets. Alternatively, administration officials have voiced support for replacing US tariffs with voluntary Canadian quotas. A significant level of bipartisan opposition continues in Congress to the national security rationale used by the Trump administration to justify its imposition of tariffs against Canada and other allies.

Tariffs averaging 21% on Canadian softwood lumber imposed in November 2017 also remain in place.²⁶ Lumber imports from Canada account for 28% of US sales²⁷ and are equivalent in volume to 38% of US production annually.²⁸ Data from wood products price tracking publication Random Lengths indicates that lumber costs per 1,000 board feet rose 50–60% in the 18 months ending in mid-2018.²⁹ According to lumber/building material trade publication *LBM Journal*, the increases were due in part to tariffs, but also to fires, pine beetle infestation, and winter weather rail delays in Canada.³⁰ The National Association of Home Builders has calculated that these factors in combination add an estimated \$9,000 to the construction cost of a single-family home and an estimated \$3,000 for a multi-family unit³¹—costs that builders have so far been able to pass on to buyers yet are significant enough to create uncertainty around new entry-level home and multi-family projects.

Canadian Chamber of Commerce chief economist Trevin Stratton maintains that “Canada didn't make gains, but probably lost as little as possible” in the NAFTA renegotiations, adding that the greatest impacts have been seen in cross-border industrial supply chains—particularly automotive—and in legacy sectors like

metals, lumber, and agriculture. “Although USMCA helped to ease investor anxiety, there remains a lot of uncertainty about the ratification process and lingering steel and aluminum tariffs. There’s a belief not only from government but also from business that we need to diversify trading partners, and we have to focus more on enhancing our productivity and competitiveness.”³²

Changes to country of origin rules in the new USMCA, Stratton points out, add compliance costs from tracking where parts and components come from and at which wage scale, and then adjusting supply chains to manage costs. The same would be true for steel and aluminum if Canada were to accede to US demands to substitute quotas for tariffs.

The US withdrawal from the Trans-Pacific Partnership (TPP) in January 2017 produced a disconnect that may work to the competitive disadvantage of the United

States in Asia-Pacific markets. Eleven countries including the United States and Canada were signatories to TPP, an agreement to lower trade and investment barriers and address issues such as IP protection and cross-border data movement. The US withdrawal—one of President Trump’s first executive actions—was a setback for countries such as Vietnam and Japan that hoped to leverage its terms to advance domestic reforms and forfeited intensively-negotiated market opening measures. The remaining ten TPP signatories, led by Japan and Canada, subsequently agreed to continue the agreement without the United States, adopting the new name Comprehensive and Progressive Trans-Pacific Partnership (CPTPP). CPTPP entered into effect in December 2018, reducing trade and investment barriers among its members. One likely outcome is that US exports will become less competitive with Canadian exports in major Asia-Pacific markets such as Japan.

SPOTLIGHT

Bombardier and BART

BART's New "Fleet of the Future" has Arrived

The first 10 cars in an ambitious fleet replacement program began gliding through the Bay Area Rapid Transit (BART) system in January 2018, part of an original 775-car order from Montreal-based rail equipment builder Bombardier Transportation that is expected to complete delivery by 2022. As of February 2019, 60 of the new cars are available for revenue service, with four 10-car trains in regular service and the remaining new cars in use for operator and technician training or temporarily out of service for regular maintenance.³³

BART issued a request for proposals for its fleet replacement in 2009, as most of its cars in operation were over 30 years old and reaching the end of their useful life even after rehabilitation. With a non-standard track gauge and the lightest train car for its size in the US, BART is a unique rail system requiring custom-made cars. After a year-long evaluation and clarification process, Bombardier was chosen from among the bidders in 2012. BART's ultimate goal is to increase its fleet to 1,200 new train cars; in November 2018, its board of directors authorized negotiations with Bombardier for additional cars beyond the original 775-car contract.

The new cars are also far more complex than the ones they replace, each with 30 microprocessors and running on 180 separate software programs.³⁴ Montreal

industrial design firm Morelli Designers added a third set of side doors to each car to speed boarding and exiting, along with redesigned seating, digital travel information displays, bike racks, and added wheelchair-accessible spaces. The new car design was required to pass rigorous tests in accordance with a California Public Utilities Commission checklist that includes 1,870 safety-critical items.³⁵

The Bombardier contract meets US Federal Transit Administration (FTA) requirements that domestic components account for at least 60% of the total cost of all components used to build new transit vehicles and that final assembly take place in the US. The new cars also meet a 66% Buy America standard, with companies in the US supplying the propulsion system, brakes, raw aluminum used for the body, and much of the electrical wiring. Bay Area jobs support the design, commissioning, warranty, and other activities associated with equipment and system delivery.

So far, BART's expanded "Fleet of the Future" has been well-received by riders in terms of quiet, comfort, and convenience. The system has come a long way from its initial ridership of about 50,000 each weekday to 440,000 at present. The new cars, along with an upgraded control system that will increase Trans-Bay Tube capacity by 45%, will help BART meet demand of up to 770,000 weekday riders by 2040.³⁶



FDI: Interconnected by Investment

Key Takeaways:

- Two-way US-Canada FDI is roughly balanced; in 2017, the US accounted for almost half of the stock of FDI into Canada; Canada was the second largest source of the stock of FDI into the US.
- The flow of FDI into Canada posted a net decline in 2017, in part due to a slump in the energy sector, but has rebounded strongly in 2018 with the inflow of FDI into manufacturing almost doubling; the strongest growth in Canada's FDI stock in 2017 was in finance and insurance followed by wholesale trade.
- Southern California's large population and manufacturing base has attracted a larger share of Canadian manufacturing, aerospace, retail, and property investment; the Bay Area has drawn mostly smaller deals technology, biotech, renewable energy, and finance.
- US tariff threats and tax cuts, plus the relative size and strength of California's economy, have drawn some Canadian companies to the state.

Government of Canada data shows that the stock of two-way US-Canada foreign direct investment totaled more than C\$909 billion in 2017, composed of

C\$504.8 billion in Canadian FDI into the US—up 4.9% from the previous year—and C\$404.5 billion from the US into Canada, up 4.2% from 2016. (Stock refers to the magnitude of investment that has accumulated over time, as opposed to the flow of new investment made in a given period.) The US was by far the largest investor in Canada, accounting for 49% of the stock of Canadian foreign direct investment from the world in 2017.¹ Data from the US Department of Commerce—which calculates FDI differently and, of course, measures in US dollars—shows that Canada was the second largest source of FDI into the US in 2017, supplying US\$523.7 billion, or about 13% of the total 2017 stock of FDI into the US.²

Even though Canada's stock of foreign direct investment has risen, the flow of FDI into Canada has shown declines in recent years. Total FDI into Canada posted a net decline during 2017, as foreign investors withdrew from the energy sector, some manufacturers chased lower corporate tax rates in the US, and deal activity stalled over uncertainty created by the renegotiation of NAFTA. The direct investment flow in 2017 fell 36.4% from 2016, to C\$31.5 billion.³ Capital inflows declined by half over 2015–2017, with much of the new

investment coming from reinvested earnings within the country. Net foreign purchases of Canadian businesses turned negative for the first time since the global recession, as foreign investors sold more assets than they acquired.⁴

Canada’s FDI flow has since rebounded, however, reaching nearly C\$27 billion in the first half of 2018, more than double the C\$11 billion inward investment flow in 2017 and slightly above the 10-year average. Energy continued to lag, having lost C\$8.6 billion (US\$6.5 billion) over the five quarters ending June 30, 2018, but manufacturing FDI reported the strongest six-month gain in five years, attracting C\$15 billion (US\$11.3 billion). High levels of reinvested earnings also suggest capital spending to add capacity.⁵

The strongest growth in Canada’s FDI stock in 2017 was in finance and insurance followed by wholesale trade. FDI stock in the oil and gas extraction sector fell as some foreign investors sold assets back to Canadian investors. While the FDI stock in manufacturing posted a net decline—driven by falling production of petroleum and coal products—the FDI inflow into manufacturing

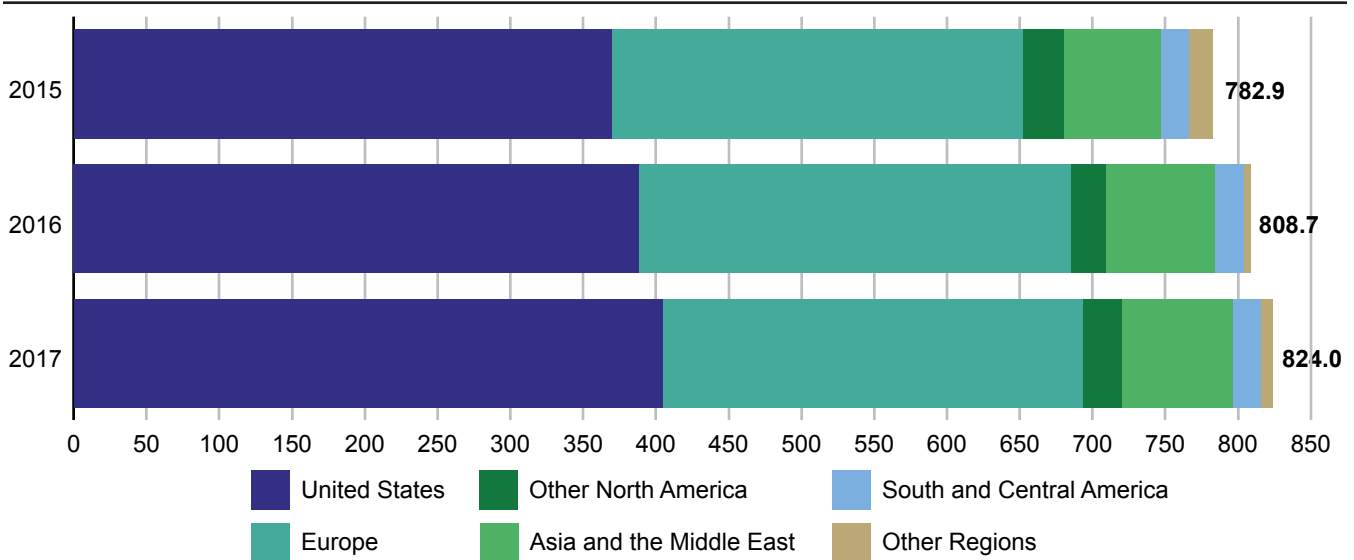
almost doubled, and the sector retained its top spot in the ranking of FDI stock sectors in 2017, with a 21.4% share. The strongest growth in outbound Canadian direct investment abroad (CDIA) in 2017 was in trade and transportation, followed by outflow increases in finance and insurance, and management of companies and enterprises (through investment in a controlling shareholder stake).⁶

In 2017, Canada was the largest foreign investor in the US, according to the US Commerce Department’s Bureau of Economic Analysis, spending more than US\$66 billion on an ultimate beneficial owner basis (UBO)—meaning the actual source of the investment versus a third country investment through a US entity.⁷ FDI from Canada directly supports more than 679,000 jobs in the US. Canada has invested \$1 billion in research and development and contributed \$14.5 billion to US goods exports through its investments, according to US Department of Commerce investment support arm SelectUSA. Top US industry sectors for Canadian investment include software and IT services, financial services, business services, industrial machinery, textiles, and real estate.⁸

EXHIBIT 17

The US was by far the largest investor in Canada, accounting for 49% of the stock of Canadian foreign direct investment from the world in 2017.

Stock of Foreign Direct Investment Into Canada by Regional Source, 2015–2017, C\$ billions



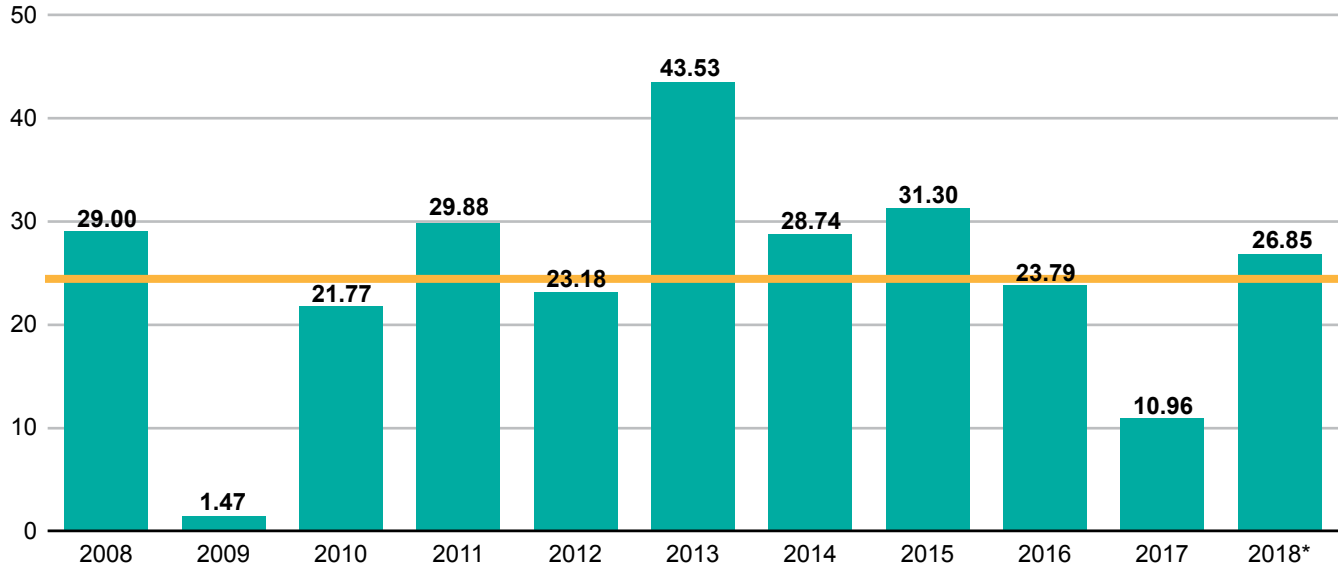
Source: Asia Pacific Foundation of Canada, Statistics Canada

Visualization: Bay Area Council Economic Institute

EXHIBIT 18

Canada’s FDI flow rebounded in the first half of 2018, reaching nearly C\$27 billion, or more than double the C\$11 billion inward investment flow in 2017 and slightly above the 10-year average.

Flow of Foreign Direct Investment Into Canada, 2008–August 2018, C\$ billions — 10-Year Average (24.59)

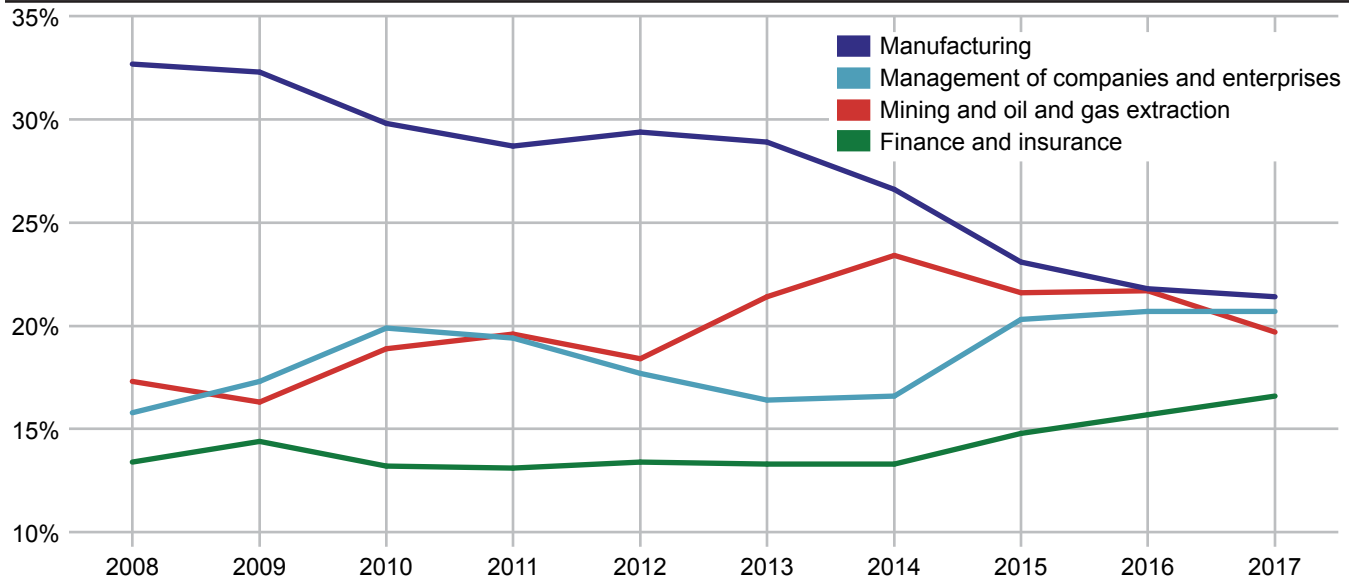


Source: Statistics Canada, Bloomberg Calculations. *2018 data Jan–Aug YTD.

EXHIBIT 19

While the FDI stock in manufacturing posted a net decline, the FDI inflow into manufacturing almost doubled, and the sector retained its top spot in the ranking of FDI stock sectors in 2017, with a 21.4% share.

Selected Industry Shares of Foreign Direct Investment Stock in Canada, 2008–2017



Source: Statistics Canada, CANSIM table 376-0052

California Investment

The two-way flow of foreign direct investment between Canada and California has historically been quiet but significant, capitalizing on synergies between the two. Regional and local data are difficult to obtain, but Southern California, with its larger population and manufacturing base, has attracted a larger share of Canadian manufacturing, aerospace, retail, and property investment, while the Bay Area has drawn mostly smaller deals in technology, biotech, renewable energy, and finance.

US tariff threats and tax cuts, plus the relative size and strength of California's economy, have drawn traditional Canadian industries to the state. For technology companies, especially later-stage startups, opportunities to do more advanced research with access to deeper capital markets remain an attractive value proposition.

Outbound from the US, the same patterns largely repeat, with complementary activities in many of the same sectors. As described Chapter 5, two-way tech FDI has grown sharply since 2017. Canadian investment has focused on access to leading research clusters and financing, while established US tech incumbents and startups are setting up shop in Canada to access world-class talent close to home, escape higher living costs, and serve growing early adopter markets in areas like renewable energy, genomics, health care and AI.

In Southern California, the World Trade Center of Los Angeles 2018 annual report on FDI in the six-county region shows nearly 900 Canadian firms (up 1.9% from a year earlier) accounting for more than 40,000 jobs paying nearly \$2.8 million in annual wages in 2017. Manufacturing is the leading sector for these investments, followed by financial activities, professional and business services, retail trade, and information services.⁹ Comparable Northern California data have been unavailable to date.

Canadian pension funds are also active investors. Canadian funds collectively manage more than \$1 trillion in assets, of which approximately \$600 billion is invested inside Canada and \$400 million globally. Three of those funds rank among the 20 largest globally, and 8 rank among the top 100.¹⁰ They are also among the

top global investors in real estate and infrastructure. In the Bay Area, for example, this includes the 2011 US\$235 million acquisition of the 31-building Park Kiely residential complex in San Jose by Canadian real estate developer and operator Ivanhoé Cambridge, which is owned by the fund Caisse de dépôt et placement du Québec.¹¹ Major funds such as the Canada Pension Plan Investment Board (CPPIB), Caisse de dépôt et placement du Québec (CDPQ), the Ontario Teachers' Pension Plan (OTPP), and the Ontario Municipal Employees Retirement System (OMERS) are increasingly looking to Silicon Valley for opportunities, as either limited partners or strategic investors, including earlier-stage deals than in the past. A Canadian fund, for example, holds the debt of Silicon Valley's high profile fuel cell company Bloom Energy and will become its largest shareholder if, as has been proposed, that debt is converted to stock.¹²

A sampling of significant recent Canadian FDI transactions in California from the Financial Times fDi Markets database¹³ includes the following.

- Oct. 2018: Ontario-headquartered hydrogen fuel generation and fuel cell module company Hydrogenics opened an \$11 million Carlsbad, CA maintenance/service facility for its statewide fueling, energy storage, and power systems, that also integrates its systems into heavy-duty trucks and buses.
- Aug. 2018: Vancouver, BC-based urban athletic apparel retailer RYU Apparel invested \$77 million, opening stores in Newport Beach and Venice.
- April 2018: Ontario-based Canadian Solar located a \$24.8 million headquarters in Walnut Creek, consolidating its module and systems business, its energy business, and its subsidiary Recurrent Energy project development unit that has solar projects in Kern and Fresno counties.
- Nov. 2017: Alberta oil and gas drilling fluids manufacturer/distributor Bri-Chem opened a \$16 million drilling fluid and oilfield cementing lab and testing facility at its building in Bakersfield.

- Oct. 2017: Novoheart, a Vancouver-based stem cell biotech firm, invested \$37 million in a state-of-the-art R&D presence as part of a research collaboration located in The Cove collaborative innovation space at UC Irvine.
 - June 2017: Richmond, BC steel spring and wire manufacturer Tree Island Steel opened a \$49 million manufacturing plant in San Bernardino, expanding and consolidating two former nearby facilities into one.
 - Oct. 2016: Ontario-based organic waste management firm Lystek International opened an \$83 million organic material recovery facility to capture and treat biosolids and other organics from Fairfield's wastewater treatment system, producing biogas and fertilizer.
 - Sept. 2014: Ontario natural and organic foods producer SunOpta invested \$46 million to further expand its Modesto beverage manufacturing facility, which had already expanded several times since its establishment in 2010.
 - July 2014: Diablo Technologies, an Ottawa fabless semiconductor design firm, opened a \$58 million US headquarters in San Jose to establish an engineering and sales/marketing presence in Silicon Valley.
- And the following list is a sampling of recent significant California foreign direct investments in Canada.
- Jan. 2019: San Francisco cloud networking solutions provider Tigera invested \$90 million to open a software engineering and development office in Vancouver.
 - Sept. 2018: San Francisco online grocery delivery service Instacart has invested \$71 million to expand its Toronto office, adding 200 jobs.
 - Sept. 2018: Santa Clara semiconductor firm Intel invested \$544 million to open a graphics chip engineering and design laboratory in North York outside of Toronto.
 - Sept. 2018: Uber, the San Francisco ride-hailing company, committed more than \$200 million to build a new engineering hub and expand its advanced technologies center in Toronto, with a focus on autonomous vehicle R&D.
 - Sept. 2018: Santa Clara county radiotherapy equipment maker Varian Medical Systems opened a \$27 million innovation center in Montreal, focusing on health informatics technologies to expand cancer care.
 - Aug. 2018: Identity verification software developer Jumio of Palo Alto opened a \$6.6 million AI lab in Montreal, capitalizing on proximity to the University of Montreal AI research cluster and the city's lower cost of living.
 - Aug. 2018: Upgrade, Inc., a San Francisco-based fintech company, announced a planned investment of \$8.9 million to open a new development center in Montreal. The plans include ramping up to 100 jobs at the center within two years as Upgrade continues to develop innovative consumer credit products.
 - July 2018: San Mateo cloud computing services provider Aryaka Networks invested \$45 million in a network infrastructure point-of-presence in Toronto to serve the Canada market.
 - March 2018: CloudFare, a San Francisco web performance/security firm, committed \$45 million to open a data center in Winnipeg. Along with two other new data centers in Calgary and Saskatoon, it brings the company's Canadian presence to six cities, joining Toronto, Montreal, and Vancouver.
 - March 2018: San Francisco data center developer/operator Digital Realty Trust invested \$45 million to convert a former newspaper printing facility in Vaughan (outside Toronto) into a state-of-the-art wholesale data center.

SPOTLIGHT

A Tale of Two Banks

The US\$5.4 billion acquisition of Los Angeles-based City National Bank (CNB) by Royal Bank of Canada (RBC) in 2015 generated major synergies for both.¹⁴ Canada's economy was slowing, largely in the energy sector, which was a key strength for RBC. Moreover, the Canadian banking market was saturated. RBC had made previous efforts to expand into the US in the 1990s and early 2000s, but had expanded too quickly with bank acquisitions in the Southeast and construction loans in central California that led to losses during the 2007–2008 housing crisis. RBC sold off most of its US assets to PNC Financial Services in 2011. Looking to move beyond retail banking and, amid digital and fintech disruption and weak economic growth, it saw new diversification opportunities in private wealth management and in jumbo mortgages for affluent homebuyers.

California's economy by then was booming. City National had roots in Hollywood entertainment, health care, and real estate. Its 2000 acquisition of Pacific Bank had solidified its private wealth portfolio in the Bay Area, and a 2002 acquisition of Civic Bancorp

expanded its Northern California mortgage-lending portfolio and branch network. In 2011, it had expanded into the Atlanta and Nashville markets to serve the music industry. In 2012, it began seeking out Silicon Valley tech and VC business, along with related private wealth management.

RBC saw opportunities from the merger; CNB would benefit from RBC's size, strong balance sheet and credit rating. RBC CEO Dave McKay noted at the time that the combined high net worth populations of San Francisco, Los Angeles, and New York total more than 4.5 times that of Canada. RBC has left CNB management and branding intact. No one was laid off or fired as a result of the transaction. A first test for the merged banks was applying CNB's connections and know-how with RBC's capital markets expertise in an IPO for Santa Monica cancer treatment drug developer Kite Pharma, Inc. The merged RBC has now expanded into New York, Boston and Washington, DC and opened a CNB regional banking center in Minneapolis. The goal: a doubling of 2015 pre-tax profits to \$1 billion by 2020 and a minimum 4.5% US market share.¹⁵

SPOTLIGHT

A Cross-Border Marijuana Market

Canada legalized marijuana use in October 2018. Deloitte predicts a \$5–8 billion annual direct market, reaching more than \$12 billion if growers, infused product makers, testing labs and security are factored in, and more than \$22 billion when tourism, paraphernalia, taxes and license fees are added.¹⁶

The Cannabis Act, passed in June, allows adults to

- purchase limited amounts of fresh cannabis, dried cannabis, cannabis oil, cannabis seeds, or cannabis plants from retailers authorized by the provinces and territories;
- possess up to 30 grams of dried legal cannabis or equivalent in non-dried form in public;
- consume cannabis in locations authorized by local jurisdictions;
- grow up to four cannabis plants per household for personal use, from licensed seeds or seedlings from licensed suppliers;
- share up to 30 grams of dried cannabis or equivalent with other adults; and

-
- make legal cannabis-containing products at home, such as food and drinks, provided that dangerous organic solvents are not used in making them.

Provisions in the Act also restrict youth access and prohibit advertising to minors, establish product and safety requirements, and require health warnings.

While a number of US states, including California, have legalized cannabis, sales and use remain a crime under US federal law. This creates an opportunity for risk-tolerant investors, as valuations for California cannabis companies remain low relative to their Canadian counterparts. California is an especially attractive investment destination because there is no residency requirement for ownership. There is also an important incentive for California companies: capital for investment in cannabis is relatively abundant in Canada compared to the US and California, where under federal law cannabis companies lack access to normal banking services. Cannabis companies with operations in the United States are also unable to list on US stock exchanges. On the other hand, cannabis companies with operations in the United States can list on the Canadian Securities Exchange; Canada's other leading exchanges, the Toronto Stock Exchange and the TSX Venture Exchange, won't accept listings from companies with US operations, but will list Canada-only cannabis enterprises, as will the New York Stock Exchange and Nasdaq.

The first three quarters of 2018 saw 40 US acquisitions by Canadian buyers, up from 17 in 2017. Toronto-based Captor Capital Corp., for example, acquired Santa-Cruz dispensary **Chai Cannabis** in September 2018 for \$6 million.¹⁷ Captor plans to triple floor space to retail edibles, extracts and other products. It earlier acquired an ownership stake in Los Angeles dispensary chain **MedMen** for \$23 million, which includes stores in West Hollywood and Santa Ana,¹⁸ and has also expanded into Emeryville with the purchase of a licensed dispensary from B12 LLC.

Pivot Naturals, a US subsidiary of Canada's Pivot Pharmaceuticals, executed a lease agreement in May 2018 for a 5,283-square-foot industrial space¹⁹ in Costa Mesa for use as its headquarters manufacturing facility to make powdered and infused cannabis products.²⁰

CannaRoyalty, a publicly listed Ottawa holding company, made four California acquisitions in 2018. It purchased Sonoma County dispensary **FloraCal Farms** for C\$1.3 million and 3.5 million shares of stock, with a commitment to invest another C\$3.8 million in expansion at the 42,000-square-foot FloraCal facility. CannaRoyalty also acquired distributors **Alta Supply** and **River Distribution (RVR)**, as well as edibles and vaporizer maker **Kaya Management**.²¹ In a related transaction, **Origin House**, an Ottawa cannabis brand and products company affiliated with CannaRoyalty and FloraCal, acquired a 24,600-square-foot growing facility and proprietary technology from Santa Rosa-based cannabis cultivator **Cub City LLC** for US\$7 million in December 2018.²²

Oakland's **Harborside**, one of the largest dispensaries in the US with 220 employees and 100,000 clients, has entered into a reverse takeover with Toronto-based **Lineage Grow**, that will allow it to assume Lineage's listing on the Toronto Stock Exchange, enabling it to raise expansion capital. Harborside will own 81% of the stock of the combined companies. Andy Berman, who will be CEO, observes that "Canada is the place where you can have better access to the capital markets right now." The company plans to raise \$53 million through the listing.²³

TerrAscend, a Toronto cannabis producer, will purchase **Apothecarium**, which operates three dispensaries in San Francisco and Las Vegas, for \$118 million.²⁴

These investments come with distinct risks. Under US law, anyone working in or involved with marijuana production, distribution, or sales may be denied entry into the US and be subject to a permanent ban. One-year waivers can be obtained for \$930 if filing with US Citizenship and Immigration Services (USCIS) or \$585 if filing with US Customs and Border Protection (CBP) but are granted at the discretion of the approval officer.²⁵ Investors and employees of Canadian cannabis companies have been denied entry in small numbers, but anecdotal evidence of increased detentions and lifetime bans has led some in the industry to restrict travel or rethink their US investment strategies. The Toronto Stock Exchange, meanwhile, advised marijuana companies in late 2017 that they could be de-listed for having US investments.

SPOTLIGHT

Old Canada Hands: Chevron and Wells Fargo

Major Bay Area companies in industries outside tech have had sizable Canada investments for decades.



Chevron Corp. was an early entrant in Canada's energy trade, beginning with a small Standard Oil Company of California exploration team arriving in southern Alberta in 1938. Today, Calgary-based **Chevron Canada** has interests in oil sands projects and in shale gas and liquids exploration in Alberta; exploration, development, and offshore production projects in Newfoundland and Labrador; a proposed liquefied natural gas (LNG) project and shale acreage in British Columbia; and exploration in the Beaufort Sea region of the Northwest Territories. These include the following:²⁶

- a 70% interest in 330,000 acres in the Duvernay formation of Alberta province north of Edmonton—55,000 acres selected for initial development of shale gas liquids—through KUFPEC Canada, a joint venture with the Kuwait Foreign Petroleum Exploration Co.;
- a venture with Woodside Energy International (Canada) for development of natural gas reserves in the Liard and Horn River Basins in northeastern British Columbia, the 298-mile Pacific Trail Pipeline across BC to the coast, and the proposed Kitimat liquefied natural gas export facility under a 20-year supply contract with the National Energy Board;
- nonoperated working interests or minority stakes in four offshore oil drilling projects off St. John's, Newfoundland that began with discovery of the Hibernia field in 1979 and involve drilling to a depth of 13,000 feet, wells 4.5 miles in length, and platforms built to withstand collisions with icebergs; and

- a 20% nonoperated interest in the Canadian Natural Resources Athabasca Oil Sands Project and a 60% operated interest in its Ells River heavy oil leases.

Through its Chevron Lubricants subsidiary, Chevron Canada produces and sells auto, truck, marine, and industrial lubricants throughout Canada. In September 2017, it sold off its retail fuel refinery, transferring terminal and gas station assets to Parkland Fuel Corp.

Since **Wells Fargo Bank** was founded in 1852 in San Francisco as an extension of the Wells Fargo express overland stagecoach passenger and mail service, its charter has included Canada in its service territory. It opened an express service office in Victoria, British Columbia in 1858 during the Fraser River Gold Rush, which became a full-service branch in 1873. In 1911, it acquired Alaska-Pacific Express, a Seattle rail/ocean freight and mail carrier to Alaska via Canada. In 1917, it opened an office at Port Stanley, Ontario on the northern shore of Lake Erie. In 1982, after Canadian restrictions on foreign banks were eased, Wells Fargo Bank Canada opened its headquarters in Calgary.

Today, Wells Fargo operates a cross-border network of US bank branches in Alaska, Washington, Montana, North Dakota, and Minnesota, plus offices across Canada that specialize in equipment, inventory, and other business financing. Its Wells Fargo Equipment Finance equipment leasing and finance unit served more than 20,000 Canadian business clients in 2016 as Wells Fargo Equipment Finance Company, with offices in Kamloops, BC, Edmonton, Regina, Saskatchewan, and Montreal. With some C\$3.5 billion in assets under management²⁷ it offers equipment purchase and lease financing in the construction, health care, technology and transportation sectors, including vendor financing services for equipment dealers, manufacturers, and distributors.

In March 2016, Wells Fargo acquired the North American business of Commercial Distribution Finance (CDF) from GE Capital, expanding the bank's capabilities in Canada to include inventory and accounts receivable financing, asset-based lending, private label financing, collateral management, and related services. Wells Fargo Rail, based in Rosemont, Illinois, is a rail equipment operator/lessor with a total fleet of 175,000 rail cars and 1,800 locomotives and provides leasing, financing, fleet management, and marketing services to clients in the US, Canada, and Mexico.²⁸



Canadians in Silicon Valley: Human Capital and Commerce

Key Takeaways:

- Canadians occupy leading executive positions in a wide range of Bay Area companies, particularly in tech.
- Canada, alongside Israel, is also the leading source of immigrant founders of billion-dollar companies in the US; out of nine such companies, six are in the Bay Area.
- C100, a leadership group of senior Canadian executives, provides a support network for Canadian entrepreneurs in the Bay Area.
- In recent years, more capital in the market and positive policy changes have expanded the options in Canada for both Canadian entrepreneurs looking to remain in Canada and for Silicon Valley founders lured by lower startup costs and the Canadian talent pool.
- Leading Canadian financial institutions such as Royal Bank of Canada are active in Silicon Valley, mirroring investment in Canada by large Bay Area companies such as Wells Fargo Bank and Silicon Valley Bank, which has a strong focus on startups and lending in the tech and life sciences space. Most of the Bay Area's leading venture capital firms are active in Canada, particularly in Toronto.

The first Canadians settled in California in the early 1800s as the British fur trade moved west and south in search of new supplies and markets. An 1804 treaty between the US and Britain permitted Canadian settlers to trade in US territory, and traders with both the Hudson's Bay Company (HBC) of northeastern Manitoba and the Montreal-based North West Company (NWC) steadily expanded their territory down into the Missouri Valley and eventually the Columbia/Snake River region in Oregon.

HBC and NWC merged in 1821 to better compete with American and Russian traders and to settle the territory in advance of US westward expansion. From its Fort Vancouver headquarters the company came to administer British territorial claims from Alaska to Oregon and east to the Rockies. In 1828, chief trader Peter Skene Ogden led a nearly two-year expedition that followed the Humboldt River to the Sierra Nevada and then proceeded south to the Gulf of California. By 1841, HBC had established an office on Montgomery Street in San Francisco.

With the Gold Rush and California statehood in 1849, the fur trade was eclipsed by a flood of clothing, tobacco, food, and dry goods suppliers on the West

Coast. Over time HBC closed down its California and Northwest operations. Many Canadian trappers stayed behind, settling in Oregon and California as farmers or merchants.

After two failed free trade attempts in 1874 and 1911, US-Canada trade was eventually liberalized under the 1935 Reciprocal Trade Pact. Defense production sharing arrangements during World War II integrated manufacturing for military purposes. A 1965 Auto Pact freed trade in autos and parts for cross-border production and assembly.

In subsequent decades, a convergence of factors has broadened and deepened the California-Canada trade and investment relationship dramatically. Among them are

- new markets in computing, telecommunications, aerospace, and biotech;
- California's demand for engineers in those fields;
- emerging cross-border energy and financial markets; and
- relaxed trade restrictions under the Canada-US Free Trade Agreement (FTA) and NAFTA.

Canada's push to industrialize in the 1960s began in Ontario province at the University of Waterloo. The University was established in 1957, ostensibly to produce insurance industry actuaries and engineers in manufacturing. While most Canadian universities emphasized humanities, Waterloo emphasized STEM studies, with the broader objective of more closely aligning university education with business community needs. Co-founder Gerry Hagey, an executive with tire maker BF Goodrich, launched a computer center in 1960 which, by 1967, was formalized as a full computer science department with dedicated engineering faculty. Graduates were actively recruited by IBM and other companies and were instrumental in the rise of Canada's ICT sector, including companies such as Nortel Networks, Telus, Rogers Communications, and Blackberry developer Research in Motion.

Other universities across Canada leveraged their own strengths in STEM fields to adopt similar models for advanced manufacturing, life sciences, energy, and

agriculture, setting the stage for today's superclusters. Since the late 1950s, Canada has produced important figures in the advancement of technology, including many of Silicon Valley's technology leaders:

- **Cecil Green**, a University of British Columbia and Massachusetts Institute of Technology graduate in electrical engineering, teamed with three partners to acquire Geophysical Services, Inc., a Dallas company making radar and sonar equipment for oilfield exploration and submarine detection during World War II. Renaming the company **Texas Instruments** in 1951, they developed the first commercial semiconductor, transistor radio, and integrated circuit by 1958.
- University of Calgary and Carnegie-Mellon University graduate **James Gosling** joined **Sun Microsystems** in 1984 and developed the Java programming language during his 26-year career there. Gosling left Sun in 2010 during its acquisition by Oracle Corp., moving first to Google and later to Amazon Web Services.
- **Shaan Pruden** earned a BSc at the University of Victoria in 1983 and joined **Apple** Canada in 1989. She relocated to the company's Cupertino headquarters in 1993 as senior director of worldwide developer relations and is currently senior director of partnership management. Often referred to as "the most powerful woman at Apple," she was instrumental in development of Apple's app store.
- Montreal native **Jeff Skoll** graduated from the University of Toronto in 1987 and Stanford University Business School in 1993. He wrote the original business plan for **eBay** and served as its president from 1996–1998.
- **Sukhinder Singh Cassidy**, a native of St. Catherine's in Ontario province near Niagara Falls, began her career as a financial analyst with Merrill Lynch. She later co-founded financial data aggregation platform **Yodlee** in 1999, ran **Google's** Asia-Pacific and Latin American operations from 2003–2009, founded video shopping network **Joyus**, and is currently president of online ticket service **StubHub**.
- **Don Listwin**, originally from Saskatoon and a University of Saskatchewan graduate in electrical engineering, joined **Cisco Systems** in 1990 as

employee #291. He rose within the company to become executive vice president and a likely successor to founding CEO John Chambers, but left in 2000 for Redwood City mobile internet software and equipment maker **Openwave**.

- **Yahoo!** Founder Jerry Yang hired North Vancouver native **Jeff Mallett** as president and COO in 1995, when the company was an 11-employee startup. Mallett, who had attended San Francisco State University and had headed the global consumer division of software maker WordPerfect and then the consumer products division of software firm **Novell** after it acquired WordPerfect, helped take Yahoo! public and assisted with entertainment and media acquisitions.
- Angel investor **Chamath Palihapitiya**, a University of Waterloo graduate, became bored with derivatives trading in Toronto with BMO Nesbitt Burns, moved to California with his girlfriend—later his wife—and ended up running digital music startup **Winamp**, which was acquired by **AOL**. He joined AOL, heading its instant messaging division. In 2005, **Napster** founder Sean Parker introduced him to Mark Zuckerberg, and they concluded a deal to integrate the AOL instant messaging chat function with **Facebook**, then a startup. In 2006, Palihapitiya joined Facebook to work on the initial platform, advertising model, and growing the user base. He has since launched AI-driven socially responsible VC investment firm Social Capital and is part owner of the Golden State Warriors basketball team.
- **Garrett Camp**, co-founder of **Uber**, hails from Calgary. He earned a BSc in electrical engineering followed by a master's degree in software engineering from the University of Calgary. While still at the university, he launched the personalized search application **StumbleUpon** and moved it to the Bay Area in 2006. Since launching Uber in San Francisco in 2010, he has gone on to found entrepreneur network **Expa**, fold StumbleUpon into a new discovery platform called **Mix**, and invent a new cryptocurrency.
- **Rob Burgess**, a graduate of McMaster University in Hamilton, Ontario, was CEO of San Francisco web development software maker **Macromedia** from

1996–2005, moving to **Adobe Systems** with its \$3.4 billion 2005 acquisition of Macromedia. During his tenure, Macromedia helped in the development of core Adobe programs Flash, Dreamweaver, and Shockwave.

Canadians today occupy a wide array of senior positions at Facebook, Dropbox, Uber, Google, Salesforce, Zynga, Slack, and other major Bay Area technology firms, including unicorns (emerging companies valued at \$1 billion or more). Research by the National Foundation for American Policy shows that in the United States, Canada and Israel are the leading countries of origin of immigrant founders of billion dollar companies, both with 9. This leads India (8), the United Kingdom (7), China (6), Germany (4), France (3), Ireland (3), and Russia (3). In the Bay Area, this includes AppDirect (**Daniel Saks** and **Nicolas Desmarais**), Cloudflare (**Michelle Zatlyn**), Instacart (**Apoorva Mehta**), Slack (**Stewart Butterfield**), Uber (**Garrett Camp**), and Wish (**Peter Szulcowski** and **Danny Zhang**).¹

Analysis by the Migration Policy Institute indicates that 16% of the 783,000 Canadians living in the US reside in California, the most of any state. Of US urban areas, the San Francisco-Oakland-Hayward metropolitan area hosts the eighth largest population of Canadians.² Many arrived in the Bay Area during the tech bubble of the late 1990s, with more coming after the bubble burst in 2001. A key factor in that second wave was the collapse of **Nortel Networks**, an Ottawa provider of data networking equipment and solutions spun off from Bell Canada Enterprises (BCE).

In 2000, Nortel had a market capitalization of C\$320 billion, a third of the total market cap value of the Toronto Stock Exchange,³ and a workforce of 93,000.⁴ Nortel had designed and built much of the internet's early infrastructure and developed much of the equipment and software running early wireless phone networks. But an overly aggressive expansion-through-acquisition strategy, the 2001 bursting of the global tech bubble, an accounting scandal, and competition from new entrants like Cisco Systems had run up debt and saturated the market by 2002. Global recession was the final straw, leading to a 2009 bankruptcy and liquidation.

Research in Motion (RIM), developer of the Blackberry smartphone, met a similar fate. In 2007, RIM was

Canada's most valuable company and a symbol of national pride. Launched in 1984, it began by designing LED signs to communicate real-time messages to General Motors factory workers on the assembly line, and later a film editing device that synchronized optical and sound tracks. A shift in focus to secure business pagers led to design of an early Blackberry prototype in 1996 that could send texts, faxes, and email. RIM raised \$115 million on the Toronto exchange in 1997 and \$250 million on the NASDAQ in 1999. Phone capability was added in 2002. By 2004, Blackberry had 1 million subscribers.⁵ A mix of patent challenges, Apple's launch of the iPhone in 2007, and strategic missteps in responding to smartphone competition, however, eroded RIM's market position over time.

With the decline of Nortel and RIM, Canada saw a dramatic hollowing out of its IT sector during the 2000s. ICT engineers and programmers migrated south in search of cutting-edge opportunities and higher pay in Silicon Valley. British Columbia had attracted film and television production from Hollywood since the late 1970s, and later developed organically as a hub for digital special effects and animation for mainstream entertainment and video gaming. But in the IT, networking, and internet spaces, Silicon Valley was reinventing itself with mobile broadband, enterprise software, AI, big data analytics, and other disruptive technologies.

On the other side of the ledger, as Canada's world-class public universities were turning out thousands of skilled tech graduates, the domestic pool of patient, risk-tolerant venture capital needed for new business formation was relatively small, and an esoteric estate tax provision in Canada's Income Tax Act, Section 116, had the unintended consequence of stifling foreign venture investment. Section 116 was written to ensure that foreign-owned Canadian property and resource assets were properly taxed at sale or distribution. Sellers faced a months-long application process for a clearance certificate, while foreign buyers or beneficiaries were required to withhold up to half of the transaction price in case the sale went through without clearance.

Applied to VC purchases of shares in Canadian startups, the provision was a nightmare: individual US investors in a VC fund who were exempt from Canadian tax in any case had to file separate certificate applications,

while prospective buyers were stuck with burdensome withholding. An exemption for such transactions was carved out in 2010, and Canada saw new VC investment totaling around \$1.5 billion in each of the following two years.⁶ The brain drain slowed, but nonetheless continued. At that time, tech was a relatively small segment of the economy, with resources, property, and tourism performing well.

The resource-driven recession in 2015–2016 was a wake-up call. Data as recent as 2017 showed 60% of University of Waterloo software engineering graduates leaving for California as growth companies of C\$10 million or more in revenue increasingly filled job vacancies with immigrant applicants from China, India or Europe. Canadian tech companies were forecast to face a talent shortfall of up to 220,000 workers in STEM fields by 2020.⁷

Today increased Canadian public and private investment in education and research, along with tax, regulatory, and visa changes, has helped to level the playing field. Relative ease of cross-border movement, shared language, and similarities in business culture with the US are contributing to a more balanced and synergistic two-way flow of people, ideas, and capital.

Network Integration

Professional networks are an essential part of every tech ecosystem. The global nature of technology typically produces networks reflecting nationality, fields of interest—AI, optoelectronics, or chip design, for example—or both.

Networks based on national identity have served multiple purposes. They provide expat workers a sense of community and shared culture, help new arrivals navigate a new living and working environment, leverage and reinforce professional and personal connections across borders, and enable collaboration that leads to new technology advances and/or commercial opportunities. Some networks evolve organically out of member demand; others are promoted by home country governments as strategic assets to maintain connections with—and lure back home—promising tech graduates and entrepreneurs through offers of funding, lab space, or other incentives.

Canadians have not faced the same language or assimilation barriers as students and entrepreneurs from other cultures; if anything, they have complained of blending in too easily and losing their sense of Canadian identity in the US. That led in 1999 to creation of the **Digital Moose Lounge** (DML), a social and professional networking focal point for Canadians arriving in large numbers to Silicon Valley. DML hosts informal happy hours around the Bay Area, a “Chesterfield Chats” speaker series, and an annual Canada Day celebration; maintains a bulletin board alerting members to hockey games, concerts, alumni gatherings, and lectures of interest to Canadians; and helps members connect through a membership directory.

In 2010, with support from the Canadian Consulate in San Francisco, VCs Anthony Lee and Chris Albinston formed **C100**, a group of roughly 100 influential Canadian tech founders, executives, and investors, with the mission of promoting Canadian tech companies and entrepreneurs by helping them connect with talent, capital, and networks in Silicon Valley, and with VC, angel, and other funding. The group hosts “Canadians in Tech” social networking events, “Valley 101” sessions to help newcomers get acclimated to the area and business culture, an angel investing panel, and a semi-annual “48 Hours in the Valley” program offering up to 30 startups introductions, pitch sessions, and mentorship.

C100 launched during a difficult period for Canada’s tech sector. “Canada’s tech community was at a low point,” Lee explains.⁸ “Nortel had gone out of business, RIM was starting to tip over, domestic venture capital was scarce, and there wasn’t much venture activity because certain tax regulations made it a pain for US investors.” At the same time, he recalls, Canada was hosting the 2010 Winter Olympics in Vancouver and the country was actively investing in and promoting its athletes in an “Own the Podium” campaign. That provided the inspiration for them to do the same kind of thing for Canadian startups.

“One of the most significant differences between 2010 and now is that we’ve gotten organized,” Lee says. “We looked around and saw that every other country’s nationals here—from China, Taiwan, India, Ireland, Israel—had these organizations. We started C100 with the mission to leverage the experience of

expat companies here to help Canadian companies back home access talent and capital.” Lee is currently managing director of Altos Ventures, a Menlo Park venture capital firm emphasizing early-stage, founder-led companies.

In less than a decade, Lee says, the change in Canada has been dramatic. “With the increased quality of Canadian companies together with positive policy changes, every major investor on Sand Hill Road is making investments now—a billion dollars over the last several years, often without partners.” He adds that a new generation of less parochial VCs who are also less tied to research labs or government has expanded options for both Canadian entrepreneurs looking to remain in Canada and for Silicon Valley founders lured by lower startup costs and the Canadian talent pool.

Startup decisions about where to locate are complicated, according to C100 executive director Laura Buhler.⁹ Pressures for Canadian entrepreneurs to relocate to California in order to scale their companies have eased, because “there’s a lot more capital in the market in Canada now, and also enough of an ecosystem to make you want to be there.” And as Canada has relaxed and simplified its immigrant visa process under its Global Skills Strategy, US rules for H-1B specialized workers and for TN (Treaty NAFTA) and L1 visas—for cross-border specialist and managerial transfers within a company—have tightened. This has increased the administrative burden for both US firms hiring Canadian engineers and programmers, and for Canadian firms establishing US operations.

An example is **Faire**, an AI-driven platform using predictive analytics that helps local retailers source unique inventory items that are likely to sell and connects them with artisanal makers. With its business operations in San Francisco and its engineering staff in downtown Kitchener, Faire launched in 2017 after graduating from the Y Combinator accelerator program. Co-founders Max Rhodes and Daniele Perlito are alumni of Square in San Francisco; co-founder/CTO Marcelo Cortes was previously with Google’s Waterloo office. The company’s workforce grew to 74 by the end of 2018,¹⁰ serving some 15,000 retailers and 2,000 makers,¹¹ after raising a US\$12 million Series A round from Sequoia, Khosla Ventures, and Forerunner

Ventures, followed by US\$40 million Series B and US\$60 million Series C rounds, led respectively by Lightspeed Venture Partners and YC Growth.¹²

San Francisco-based **Terminal** offers a new, more flexible approach to workforce development in the Bay Area and Canada. Terminal combines workspace and tech talent recruitment for Bay Area clients, building remote engineering or software teams at locations in Toronto, Montreal, Kitchener-Waterloo, and Vancouver. The model is made easier with low-cost live chat and videoconferencing options. The company was launched by HR and facilities specialists from companies such as eBay, Google, Blackberry, Hired, Palantir, and Shopify. Investors include Kleiner Perkins, Lightspeed, Paypal founder Peter Thiel and Yahoo! founder Jerry Yang.

One important change in recent years is a new confidence among Canadian students, workers, and founders. As noted by CEO Iain Klugman of Communitech, a public-private innovation hub serving companies in the Waterloo region, “Before there was a kind of inferiority complex. If you were a Canadian startup it was assumed you would relocate—to Silicon Valley for tech, to Hollywood for media, to New York or London for finance, to Chicago for retail. Now, companies feel they have more options; they can succeed and grow in Canada. That’s a very big deal.” Equally significant, he is seeing growing interest among foreign-born entrepreneurs in the US who are from countries subject to travel and visa restrictions, and from minority tech professionals looking for a more welcoming environment.¹³

While it is more difficult to scale a global company from Canada than it is from Silicon Valley, in some cases Canada may offer an advantage. Asked why he left Silicon Valley, Ray Reddy, who at one time worked at Google and who returned to Toronto to co-found the food-ordering app company **Ritual** in 2014, observes, “There is a very local element to Ritual. It’s not one of those software companies that you can build in one spot and then scale it globally. And Silicon Valley is not really representative of typical North American cities. Number one, the number of early adopters is very high, and often you’ll see products that can work well in the Valley that may not really translate well outside of there. The

second [reason for leaving the Valley] is that incomes there are just completely out of whack. Toronto really worked out well for us. Even though it’s not in the US, it looks and feels a lot like other US cities. We were also able to stay under the radar for awhile. We were able to make a lot of mistakes, learn, and get the right model in Toronto. That took us 12 to 18 months, and then we started to launch in US cities.”¹⁴ With 200 employees and service in Chicago, New York, and Los Angeles, Ritual has raised \$113 million in 3 funding rounds.¹⁵

At least one Toronto VC, **Extreme Venture Partners**, has gone so far as to adopt an investment focus to specifically attract mobile, data analytics, and IoT startups from outside Canada, offering seed and pre-seed funding, mentorship, and guidance toward raising further funding, acting as both VC and accelerator. The pitch: founders will have a path to permanent residency in six to nine months and citizenship in two years and can bring spouses and immediate family, although they are required to hire in Canada. Focusing more on Canadian entrepreneurs, former Google CFO Patrick Pichette joined Canadian VC **iNovia** in April 2018 to lend his expertise to funding Canadian startups.

Still, the Bay Area remains a major draw for Canadian startups, with movement in both directions but the strongest flow in the direction of the Bay Area, based on the region’s talent, technology, and deep base of customers. Kenny Hawk, CEO of **Mojio**, named by Deloitte as Canada’s second fastest-growing tech company in the fall of 2018, explains why half of the connected car company’s 100 employees are based at its US subsidiary in Campbell: “I’m here because I have kids in school and I travel a lot. But as I was going back and forth from here to Vancouver, every time I was up there I would get a meeting request from someone in Silicon Valley. Nine out of 10 of my meetings were in Silicon Valley and very rarely was there a meeting, other than with the team, in Vancouver.” The reason was that many of Mojio’s partners and customers—including Bosch, Amazon, Assurant, Microsoft, SAP, and T-Mobile—have major operations in the Bay Area. It was also easier to find the talent the company needed in Silicon Valley, making a Bay Area location critical even though it’s 30% cheaper to do business in Vancouver, Hawk said. In the end, having a foot in both Canada and

the Bay Area offered advantages: “We just couldn’t find what we needed by being only in Vancouver. And with current [U.S.] immigration rules being tightened, being in both places helps us attract the people we need both here and in Vancouver.”¹⁶

Financing the Boom

CBRE’s annual Scoring Tech Talent Report indicates that Toronto created more tech jobs in 2017—nearly 29,000—than the Bay Area, Washington DC, and Seattle combined, growing almost 14% over the previous year.¹⁷ Pitchbook reported that of the 178 VC deals collectively raising \$1.3 billion for Canadian startups in the first half of 2018, 43% had participation from US funds. This trend was accelerated in part by online retailer **Shopify’s** 2015 IPO, which raised the company’s valuation to \$1.3 billion against the \$120 million raised earlier from investors. So far, about two dozen Canadian “unicorns” have each raised more than \$100 million¹⁸ to date—among them Vancouver-based social media marketing dashboard Hootsuite (\$299 million) and Ontario instant messaging app Kik (\$220 million).¹⁹ Silicon Valley VCs such as **Sequoia Capital** and **Greylock Partners** are active in Canada, as is **Silicon Valley Bank (SVB)**.

SVB recently received regulatory approval to commence operations in Canada and has opened a physical presence in Toronto, headed by former Bank of Montreal and Royal Bank of Canada executive Barbara Dirks. The bank offers business loans in the tech and life sciences space. It currently works with Canadian companies including Shopify, mobile retail loyalty app developer **Drop Technologies**, and financial services firm **Borrowell**.²⁰

SVB is carving out a niche for itself in Canada based on its 35-year track record and specialization in lending in the tech and life sciences areas, a long-term strategic approach to lending, strong Silicon Valley investor connections, and its global presence in China, Israel, the UK, and Germany, as well as US tech hubs. SVB has served the Canadian market on a cross-border basis since 2000 via its US operations, and the decision to set up a Canada operation was easy, says Win Bear, head of business development for Canada. “When you look at the venture fund statistics, the level of growth activity,

government support, the incredible tech talent, and the educational system—all of these things—it’s hard to find a reason not to be there.”²¹

Bear sees the strongest potential in AI, machine learning, quantum computing and fintech ventures, particularly in the Toronto, Kitchener-Waterloo, and Montreal markets. He sees growing interest in particular from private equity and corporate VC investment as more startups achieve scale, but points out that the number of big exits in Canada to date has been small. Overall, he is wary of irrational investor exuberance. While the availability of both local and US capital in Canada reduces the need to physically locate in Silicon Valley, Bear adds, the two-way flow of ideas and funding reinforces the Bay Area’s role as a global technology connector.

For their part, Canadian banks have begun to respond to Silicon Valley’s challenge in their home territories:

- **Royal Bank of Canada** established a Silicon Valley innovation lab in 2016, part of an initial C\$100 million (US\$78 million) seed investment program that also included labs in Toronto, London, Luxembourg, New York, and Orlando, Florida to partner with startups on blockchain, AI, big data, mobile banking, and biometric authentication projects.²²
- **Canadian Imperial Bank of Commerce (CIBC)** acquired Canadian venture firm **Wellington Financial** in January 2018, folding it into CIBC’s Innovation Banking division. Wellington, founded in 2000, has grown to a C\$300 million fund leveraging C\$900 million in investments, with offices in Toronto and Menlo Park. The acquisition enables CIBC to provide financing and advisory support to firms at all stages, along with cash management, deposit, personal wealth, and capital markets services.²³

Non-bank institutional investors in Canada also play an important role in financing innovation, at times with government coordination. In 2014, the Canadian government’s Venture Capital Action Plan (VCAP), provided for establishment of four private-sector-led funds of funds that would broaden and deepen national and provincial VC markets. Ottawa and the individual provinces committed \$1 in public money for every \$2 pledged by private investors for the four funds, up to a maximum of \$50 million each. A combined \$340 million

in government funding leveraged a total \$1.4 billion, with private funding mainly from pension funds and family foundations. By 2017, close to \$900 million had been spread among 21 new and emerging VCs and invested in nearly 200 Canadian startups.²⁴

The first of these funds to close at its maximum size of \$300 million in 2015, the Northleaf Venture Catalyst Fund, has committed capital to six venture capital funds and also made direct investments in a number of Canadian growth companies, such as online publishing and storytelling site Wattpad, cloud-based customer intelligence platform Vision Critical, electronic signature and document transmittal firm Silanis, cybersecurity services provider eSentire, and invoicing, payment, and accounting software company FreshBooks.²⁵

Separately, **OMERS Ventures**—the VC arm of one of Canada’s largest pension funds, for Ontario’s municipal employees—has invested over C\$350 million, attracting C\$1.4 billion in capital. It has directly invested in more than 30 startups since its inception²⁶ and is Canada’s

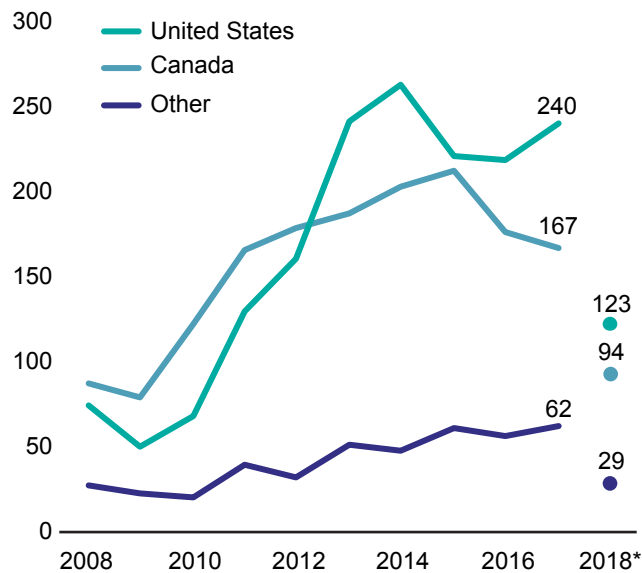
only pension fund making direct venture investment across North America. US investments have included drug treatment solutions provider **Kaleo**, online pet care services marketplace **Rover** and item-level supply chain intelligence software firm **Mojix**.

The California Public Employees’ Retirement System (CALPERS) began pursuing a similar strategy in 2017, to create a separate direct investment entity, **CalPERS Direct**, which would invest \$20 billion over the next 10 years in two in-house private equity funds that make direct investments in private companies. An Innovation fund will invest in late-stage technology, life sciences and health care companies, while a Horizon fund will take longer-term buy-and-hold positions in established firms.²⁷ CalPERS has become increasingly reliant on private equity investment—its best-performing asset class—to meet and exceed its 7% annual return on investment target. The private equity share of the CalPERS \$345 billion portfolio has averaged a 10.5% annual return over the past 20 years,²⁸ including a return of more than 16% for 2017–2018.²⁹

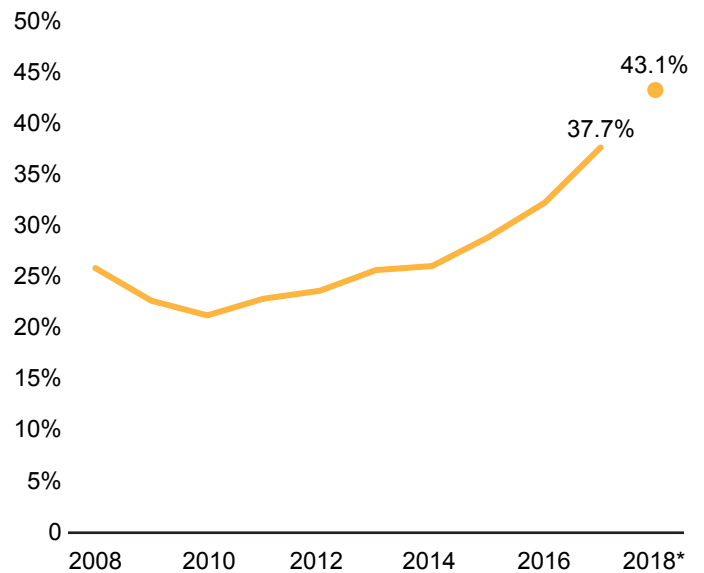
EXHIBIT 20

US investors continue to rapidly increase investment in Canadian firms. Since 2012, more US investors have invested in Canadian firms than Canadian investors.

VC Unique Investors (#) in Canadian Deals by Location



Canadian VC Activity (#) w/ US-based Investor Participation



Source: Pitchbook, *As of May 31, 2018

Like their Canadian counterparts, US pension funds have increasingly questioned the high costs and short time horizons of investments made through private equity funds. CalPERS says it plans to invest only its own capital through the two funds, and target longer-term investments—more than 10 years—that do not compete with existing PE investments. It is awaiting approval from the CalPERS Investment Committee in early 2019 and will begin making investments within 6 to 18 months.³⁰

CalPERS joined in 2018 with institutional investors managing a combined \$6 trillion in assets, among them OMERS, **Caisse de dépôt et placement du Québec**, the **Ontario Teachers' Pension Plan (OTPP)**, and the **Alberta Investment Management Corp.**, to pledge support for G7 initiatives on diversity, infrastructure and climate change.³¹ To meet its commitment, CalPERS will need to lower administration costs, build in-house expertise, and have greater investment flexibility in its private equity program as Canadian funds have done, so it will be able to write smaller checks, invest in first-time funds and projects, and hold longer-term investments in areas like renewable energy infrastructure.³²

The \$225 billion **California State Teachers' Retirement System (CalSTRS)** is undergoing a similar process and has drawn heavily from the expertise of OTPP and the Canada Pension Plan Investment Board to develop an alternative investing model.³³

University Ties

Major Canadian universities maintain an active Bay Area presence, primarily through their alumni networks and through research collaborations.

University of Waterloo, University of Toronto, McGill University, University of Ottawa, Simon Fraser University, Western University's Ivey Business School, Queen's University and others all have Bay Area chapters and are typically active through their own websites and LinkedIn. While most activities are social, they also host professional events with a tech or entrepreneurial focus. Some examples include the following:

- University of Ottawa's Bay Area Alumni Council hosted a January 2019 reception at which members helped select Ottawa's top 5 startups to receive a curated visit in Silicon Valley.

- University of Waterloo alumni hosted a June 2018 San Francisco meeting with president and vice chancellor Feridun Hamdullahpur, featuring a cross-disciplinary faculty-student alumni panel discussion on "Where UWaterloo Meets AI—Ethics".
- University of Toronto's Bay Area chapter hosted an October 2017 Faculty of Applied Engineering program on entrepreneurship, "From Startup to Success Story," featuring founders and executives with **SnapEDA**, **Kindred.ai** and **Twitter**.

The Canadian Studies Program, established in 1982 at the University of California, Berkeley, serves as a nexus for Canadians in the Bay Area and beyond. Its initiatives include a colloquium series on Canada that is open to the public and fellowships that support research on Canada.

Canadian-born scientists are leaders at Bay Area universities:

- Stanford president **Dr. Marc Tessier-Levigne**, an Ontario native who received his undergraduate degree in physics from McGill University, was a Rhodes Scholar at Oxford University before earning a PhD in physiology from University College London. He held faculty positions at UC San Francisco and Stanford and was later executive vice president for research and chief scientific officer at Genentech, bringing with him a specialization in the study of neurodegenerative diseases, including Alzheimer's and Parkinson's.
- UC Berkeley Chancellor Emeritus **Robert J. Birgeneau** is the Silverman Professor of Physics, Materials Science and Engineering, and Public Policy. A Toronto native, he was previously president of the University of Toronto, where he received his BSc before coming to the US (Yale) for his PhD. His physics research involves the phases and phase transition behavior of novel states of matter such as one and two-dimensional quantum magnets, two-dimensional liquids and solids, liquid crystals, and high-temperature superconductors. Some of his neutron scattering experiments are carried out at national facilities in Canada.

In terms of university research collaborations, **Stanford University's Institute of Theoretical Physics** has close working relationships with the **Perimeter Institute** and

the **University of Waterloo** in the study of quantum theory, in part through basic research projects involving the SLAC National Accelerator Laboratory. Research exchanges in connection with the global Laser Interferometer Gravitational-Wave Observatory (LIGO) project operated by **MIT** and the **California Institute of Technology (CalTech)** have contributed to the study of black holes and detection of gravitational “waves” in time and space dating back to the formation of the universe. Perimeter researchers visiting Stanford played a role in discovery of the Higgs-Boson particle, a key sub-atomic building block of matter.

UC Berkeley participates in research exchanges with University of Waterloo and University of Ottawa quantum computing researchers through its **Simons Institute for the Theory of Computing**. Perimeter Institute researchers apply information theory and algorithms to the study of neural and brain networks at Berkeley’s **Redwood Center for Theoretical Neuroscience**. Berkeley and Stanford physics faculty lecture at Perimeter’s annual multidisciplinary It from Qubit summer school, bringing together researchers from different areas of physics to address complex problems.

The **University of California**, the **Association of Canadian Universities for Research in Astronomy (ACURA)**, and CalTech spearheaded construction

of the nearly \$2 billion³⁴ **Thirty Meter Telescope (TMT)** project on the island of Hawaii, beginning in 2014. The project—which also involves partner institutions in Japan, China, and India—was originally conceived at UC Santa Cruz, with seed investment from the Gordon and Betty Moore Foundation.³⁵ TMT, triangulated with observations from two similar telescopes in Chile, will provide insights about the beginnings of the universe. After five years of protests and a court challenge from indigenous Hawaiians due to its planned site on the summit of the Mauna Kea volcano, Hawaii’s Supreme Court cleared construction to go forward in October 2018.

UC Davis and **University of Alberta** researchers have made preliminary discoveries about how the Zika and hepatitis C viruses reproduce at the cellular level, providing new insight into a family of viruses that also includes West Nile and dengue. The research has the potential to lead to new, more effective antiviral drug treatments, potentially benefitting millions of people with hepatitis C (3.5 million cases in the US alone) and the global population at risk for dengue fever and infection by the Zika virus. In September 2018, the joint research team received a \$1 million grant from the W.M. Keck Foundation, which focuses on pioneering efforts in the areas of medical research, science and engineering, and undergraduate education.³⁶



Canada's Evolving Tech Ecosystem

Key Takeaways:

- Despite Canada's fears of a tech "brain drain" since the late 1990s, Canada and key US tech corridors, especially Silicon Valley, have maintained a healthy back-and-forth ebb and flow of talent.
- As Canada's tech sector advances, it is providing expanded options for both Canadian entrepreneurs looking to remain in Canada and for Silicon Valley founders who are interested in relocating for lower startup costs, reduced living costs, access to funding alternatives, and world-class tech clusters in AI, gaming, cleantech, and health care.
- Canada's efforts to diversify its economy, attract global talent, and move up the skills and employment value chain are yielding impressive results in secondary and post-secondary education, innovation, and employment.
- Under a consolidated Ministry of Industry, Science and Economic Development, Ottawa is establishing regional innovation "superclusters" to attract public and private investment in education, basic research, and entrepreneurship.
- The Toronto, Montreal, Quebec City, and Vancouver metro areas have developed dynamic university, incubator/accelerator, and VC funding networks; in rural and maritime provinces, entrepreneurs are developing digital and AI solutions in mining, agriculture, forestry, fisheries, and renewable energy.
- Though on a lesser scale, Canada's major urban tech hubs have begun to experience similar growing pains to those in the Bay Area, with higher living costs and competition for talent and capital.
- The Bay Area and Silicon Valley continue to play a vital role for Canada as a global economic hub and technology connector. That role is supported by an alignment of Canadian values and priorities with those of the Bay Area and California.

Canadians are by no means latecomers to cutting-edge technology. In the 1940s and 1950s they pursued advanced studies at top US engineering schools in connection with Cold War nuclear, communications, aerospace, and other research. Those graduates were later instrumental in the

development of data network hardware and software in the early days of Silicon Valley.

The University of Waterloo's computer science program, launched in 1964, became a world leader, attracting the attention of companies like IBM and Motorola. Cecil Green, co-founder of Texas Instruments, grew up in Vancouver and was a University of British Columbia graduate; James Gosling, the father of the Java computing language, was a Calgary native with a 30-year career at Sun Microsystems prior to working at Oracle, Google, and Amazon Web Services.

It wasn't until the 1990s that Canada became concerned about a tech "brain drain" to the US. Anecdotally, the country was losing its best and brightest STEM and medical graduates to the lure of cutting-edge work and higher pay in computing, the internet, and life sciences along the corridor from San Francisco to Silicon Valley. It was a chance to join renowned, fast-growing companies supported by deep venture capital markets and by world-class universities and research labs.

Statistics Canada analyzed the trend and released a 2000 report¹ with some unexpected findings. Nearly half of Canadians moving to the US over 1994–1999 had university degrees, compared with the nationwide average of 12%. They were seven times as likely to report annual incomes over \$150,000. Professors with seniority were more likely to leave the country than move between provinces.

The real surprise, however, was who was moving to Canada: From the mid 1980s through 1997, computer scientists coming to Canada increased by a factor of 15; engineers by a factor of 10, and natural scientists by a factor of 8. Over 1990–1996, Canada enjoyed a four-to-one net gain in degree holders. That flow ebbed in the late 1990s as internet commercialization and data network development took off and the first Silicon Valley tech bubble began to build. This ebb and flow would continue after the bubble burst, when the first iPhone launched an era of mobility in 2007, and at points during the global recession and slow recovery.

The free flow of talent and innovation crossing the border in both directions, driven by market and

investment trends, is far from a zero-sum game. There is competition, but also collaboration and, most importantly, a unique cross-fertilization.

The Silicon Valley ecosystem grew organically from a public-private convergence of defense and aerospace research, commercialized by entrepreneurial graduates of world-class universities with access to non-traditional sources of capital, in a culture of optimism, experimentation, and risk-taking. Canada's ecosystem, in its early days more focused on medical and manufacturing technology, grew out of a more deliberate process, nurtured by public investment in education and carefully directed economic development. Both now find themselves at similar places, but with distinctly American and Canadian characteristics.

As Canada's tech sector advances, it is providing expanded options for both Canadian entrepreneurs looking to remain in Canada and for Silicon Valley founders who are interested in relocating for lower startup costs, reduced living costs, access to funding alternatives, and world-class tech clusters in AI, gaming, cleantech, and health care.

Canada has established itself as a global leader in science and technology, with one of the most innovative and competitive economies in the world.

- Canada ranks in the top 20 countries in the world (#18) in the 2018 Global Innovation Index. (The United States by comparison ranks #6.)²
- With 500,000 college and university graduates annually and 55% of workers having post-secondary degrees, Canada leads OECD countries in the education level of its working-age population.
- Canada leads G7 countries in qualified engineers and higher education sector R&D performance and ranks second in attracting venture capital investment; entrepreneurs make up 17% of the labor force.
- Canadian businesses spend a combined C\$15.4 billion annually on science, technology and innovation-related R&D spending; with just 0.5% of the world's population, Canada generates over 4% of global knowledge.³

Through a robust research infrastructure of universities, institutes, and programs, Canada has made a concerted effort over time to attract and retain global talent in support of world-class research clusters.

CIFAR (Canadian Institute for Advanced Research), established in 1982, is a public-private basic research institute with principal funding from the national government and the provinces of Ontario, Quebec, Alberta, and British Columbia, along with foundation, corporate, and individual donors. Its early work involved primarily medical research, but today CIFAR convenes programs and funds collaborative research by Canadian researchers and their global counterparts across a range of disciplines. It currently hosts some 400 fellows, scholars and advisors from 18 countries in 12 project areas, including brain development, machine learning, quantum materials and computing, the molecular origins of life, and how successful societies are organized. In 2017 the federal government named CIFAR to lead the C\$125 million Pan-Canadian AI Program.⁴

The cross-disciplinary **Canada Research Chair** program was launched in 2000 to establish 2,000 research positions at selected universities and institutions, open to global applicants.⁵ As of November 2018, more than 1,700 positions were currently filled; 8% of chairs in 2018 were from outside Canada. The program has an annual budget of C265 million. A related **Canadian Excellence Research Chair (CERC)** initiative, launched in 2008, awards selected researchers and their teams up to C\$10 million each over seven years to establish advanced research programs at Canadian universities. The first CERC group in 2010 included 18 chairholders, and a second competition was launched in 2012 to allocate 11 new CERC awards.⁶ The programs are a tri-agency initiative of the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC), with additional support from the Canada Foundation for Innovation (CFI).⁷

Perimeter Institute for Theoretical Physics was launched in 2000 with a C\$100 million investment from Research in Motion (RIM) co-founder and inventor of the Blackberry Mike Lazaridis,⁸ who went on to found the **Institute for Quantum Computing** at the **University of Waterloo** in 2002.

Perimeter managing director and chief operating officer Michael Duschenes emphasizes that, while the Institute is funded in equal parts by private donations and by the federal and Ontario provincial governments, Perimeter's basic research objectives necessitate independence from commercial interests. "We're extremely focused only on basic research," Duschenes says. "We have very little direct linkage to industry, though we are a critical link in the research-experiment-application-commercialization chain. We don't do research for hire, and given that we're at the very front end of the research chain, intellectual property is far less of an issue, since research results in basic physics are freely shared." Lazaridis' investment, he stresses, had nothing to do with the company (RIM) but rather an appreciation of the value of basic research and a recognition that theoretical physics and more precisely, quantum theory, is the common denominator behind most major technology innovation, including advanced computing, photovoltaics, wireless technology, and diagnostic imaging.⁹

"It was clear that Canada was not going to be the world leader in everything; we were not going to build the next CERN supercollider," Duschenes adds, "but we could be a focal point for attracting talent and expertise to accelerate research. It was thought was that this was an area in which Canada could lead the world, and that is what has happened." Each year around 150 resident researchers and as many as 1,000 visiting scientists work to tackle deep questions in nine principal areas of theoretical physics: condensed matter, cosmology, mathematical physics, particle physics, quantum fields and strings, quantum foundations, quantum gravity, quantum information, and strong gravity.¹⁰ The Institute also hosts a range of conferences and seminars for global researchers from around the world, offers unique training programs for high school and university students, and supports exchanges with other global centers of excellence in theoretical physics.

Two-way collaborations between Perimeter and California institutions, including Berkeley and Stanford, are common, Duschenes says. Exchanges tend to be informal and non-proprietary, with faculty and researchers going back and forth for several months at a time, collaborating on papers and projects without non-disclosure agreements or IP concerns.

EXHIBIT 21

Canada has budgeted C\$950 in matching funds to transform regional innovation ecosystems and develop 5 job-creating innovation superclusters.

Digital Technology	
Province:	British Columbia
Mission:	Apply augmented reality, cloud computing, and machine learning to improve service delivery in the natural resources, precision health, and manufacturing sectors
Tech Focus:	Virtual, mixed, and augmented reality; data collection and analytics; quantum computing
Participants (Sampling):	TELUS, Microsoft, Avcorp, Shoppers Drug Mart, Victory Square Technologies, DWave, Appnovation, Urthecast, Research Universities Council of BC
Protein Industries	
Province:	Alberta, Saskatchewan, Manitoba
Mission:	Build on Canada's reputation as a leading agricultural producer and a leading source for plant proteins, using plant genomics and novel processing technology to increase the value of key Canadian export crops (canola, wheat, pulses), in markets such as China and India, and satisfy growing markets in North America and Europe for plant-based meat alternatives and new food products
Tech Focus:	Agri-food technologies, including genomics, processing, and IT
Participants (Sampling):	Maple Leaf Foods, ISM Canada, Dow/DuPont Agriculture, Farmers Edge, Botaneco, Dot Technology/SeedMaster, Enns Brothers, Sightline Innovation, Roquette Agri-Food Canada, POS Bioscience, Conexux Credit Union, University of Saskatchewan
Advanced Manufacturing	
Province:	Ontario
Mission:	Build next-generation manufacturing capabilities, incorporating technologies such as advanced robotics and 3D printing, and focusing on training and technology adoption
Tech Focus:	Internet of Things, machine learning, cybersecurity, additive manufacturing (3D printing)
Participants (Sampling):	Linamar, The Woodbridge Group, Autodesk, Clearpath Robotics, Myant, Thalmic Labs, Voestalpine High-Performance Metals, Communitech, MaRS Discovery District, University of Waterloo
AI-Powered Supply Chains (SCALE.AI)	
Province:	Quebec
Mission:	Develop intelligent retail, manufacturing, transportation, infrastructure, and information and communications supply chains using artificial intelligence and robotics, and help Canadian small and medium-sized businesses scale up to increase export competitiveness
Tech Focus:	Artificial intelligence and supply chain technology
Participants (Sampling):	Optel, CGI, Agropur, Aldo, Air Canada, CN, Coveo, NEXT Canada, IVADO, University of Waterloo
Ocean	
Province:	Atlantic Canada
Mission:	Harness emerging technologies to strengthen Canada's ocean industries (marine renewable energy, fisheries, aquaculture, oil and gas, defense, shipbuilding, and transportation) to create jobs and address global challenges such as meeting the energy demands of the 21st century
Tech Focus:	Digital sensors and monitoring, autonomous marine vehicles, energy generation, automation, marine biotechnology, and marine engineering technologies
Participants (Sampling):	Petroleum Research Newfoundland & Labrador, Emera, Cooke Aquaculture, CFFI Ventures, PAL Aerospace, Cuna del Mar, Scotia Seafood Producers, SmartICE, Dalhousie University, Memorial University of Newfoundland

Source: ISED, Government of Canada

Although the research at Perimeter is purely fundamental, the collaborative environment and focus on the most difficult questions produces scientists whose advanced skills are applicable in areas beyond pure academia. Perimeter occupies an important niche for researchers working in highly specialized fields with relatively narrow options for doing their chosen work. “We see some really brilliant PhD students and postdocs who aren’t going to work in academia—there just aren’t enough jobs for them,” Duschenes says. “Where you see people who are good at research, at problem solving, they’re going to find work in the private sector or maybe Wall Street.”

The **Canada Foundation for Innovation (CFI)** was created in 1997 to help fund facilities and equipment purchases for Canadian universities, colleges, research hospitals, and non-profit research organizations, in furtherance of their research. CFI accepts project submissions from these institutions and, using a three-level peer evaluation and merit-review selection process, makes financial contributions that increase the capacity of institutions across Canada to advance innovation and conduct leading-edge research. Government of Canada funds channeled through CFI provide 40% of the funding for the selected projects, and the institutions must secure the remaining 60% in partnership with provincial governments, the private sector, and other public and non-profit sources.¹¹

Projects funded by CFI include The Canadian Light Source, Canada’s national synchrotron facility, which is used by scientists to get information about the structural and chemical properties of materials at the molecular level, for use in research areas ranging from medicine to agriculture and renewable energy; the Institute for Quantum Computing in Waterloo; the Silicon Quantum Technology group at Simon Fraser University; Ocean Networks Canada, which uses cabled observatories on the sea floor, radar, and monitoring devices to deliver continuous real-time data that enables researchers, governments, and communities to make informed decisions regarding climate change, fisheries, and early warning systems for tsunamis and earthquakes; and the nanoFab—Fabrication & Characterization Centre, in Edmonton, which includes specialized equipment across 20,000 square feet of

communal laboratory space, including Canada’s largest cleanroom available to industry.¹²

“There’s really nothing like it in the US or, for that matter, anywhere else in the world,” says CFI president and CEO Roseann O’Reilly Runte, who was formerly president and vice chancellor at Carlton University in Ottawa. “We ask people what they need to drive their agendas, what is the future of the science, who is the future client of the science, and through these consultations we create a competition based on what we’ve seen and heard and what we think is feasible.” Infrastructure, Runte explains, is a costly and often overlooked component of research. Upgrading research capabilities at critical early stages helps to achieve levels of excellence that yield long-term economic benefits and innovation.¹³

Where Science Meets Economic Development

The 2015–2016 recession, rooted in falling oil and other commodity prices, led to a shift in public sentiment. There was a sense that Canada’s economy had become overly reliant on natural resources and was falling behind in the new knowledge sectors such as digitalization, automation, life sciences, and cleantech, that were essential to employing more Canadians and competing in global markets in the future.

In November 2015, incoming Prime Minister Justin Trudeau consolidated the Ministry of Industry and the Ministry of Science and Technology to create a single **Ministry of Innovation, Science and Economic Development**, with the intent of bringing science and industry together to further commercialize research.¹⁴ Within the Ministry, a single lead agency, **Innovation, Science and Economic Development Canada (ISED)**, coordinates the activities of 17 federal agencies and their foundation and institutional partners under the **Innovation, Science and Economic Development Portfolio**¹⁵ to

- help companies and non-profits more quickly commercialize new ideas as products and services;
- encourage exports by more firms to more markets, and attract inward foreign direct investment;

- expand access to capital, information and services to small and mid-sized companies; and
- foster new economic development strategies tailored to communities' unique characteristics.

During the second half of 2016, 3 ministers and a panel of 10 university, non-profit and business leaders held 28 roundtables across Canada, directly engaging 400 people and receiving public input from nearly 120,000 toward an Innovation Agenda.¹⁶ The exercise produced a three-point challenge for the government to

- help a broader cross-section of Canadians to acquire the skills and experience to participate in the global and digital economy;
- identify ways for Canada to create new jobs and industries by harnessing emerging technologies, while reinvigorating established industries; and
- help more Canadians to start and grow companies into globally competitive successes.

In its 2016 budget, the government had committed nearly C\$4 billion to advance university and college research capabilities across Canada through business and institutional partnerships; support clean technology development; and strengthen innovation networks and clusters.¹⁷ In 2017, it further committed

- nearly C\$3.3 billion for skills development and adult continuing education, work-related placements for post-secondary and graduate students, and K–12 digital skills and coding instruction;¹⁸
- C\$2.2 billion for cleantech R&D, adoption, and financing;¹⁹
- C\$500 million for rollout of rural broadband networks nationwide;²⁰
- C\$400 million to expand late-stage venture investment by the Business Development Bank of Canada;²¹
- C\$125 million toward a **Pan-Canadian AI Program** to expand the pool of AI post-graduate trainees and researchers and attract global talent in the field;²² and

- C\$10 million in renewed funding over two years²³ to support the work of the **Institute for Quantum Computing** that was founded in 2002 at the University of Waterloo.

Most notable, however, is the C\$950 million in matching funds provided over five years, beginning in 2017–2018, for five regional, business-led innovation superclusters across Canada²⁴ that are collectively projected to add 50,000 jobs and contribute C\$50 billion to GDP over a decade.²⁵

Build It and They Will Come

This broad strategy is paying off. Toronto in particular has emerged as an important hub for fintech, insurtech, artificial intelligence, cybersecurity, blockchain, and big data analytics, with as many as 4,100 tech businesses and more than 400,000 workers in 2016, nearly a quarter of them self-employed, according to a September 2016 study of the ecosystem by Tech Toronto, a trade group.²⁶ More than a third of the C\$1.7 billion in venture funding invested in Canada in 2016 was deployed in Toronto.²⁷

IBM, Alphabet, HP Canada, Cisco, and Microsoft all have their Canada headquarters in the Toronto area, as do Facebook, LinkedIn, and Twitter. During a visit of Canada's Prime Minister Justin Trudeau to Silicon Valley in 2018, Salesforce announced that it would invest C\$2.5 billion in its Canadian operations over the next five years, increasing its headcount, real estate footprint, and data center capability to support its growing Canadian customer base. At that time, Salesforce employed more than 1,300 Canadians, serving more than 6,000 Canadian companies.²⁸ Close to a third of Canada's top 20 information and communications technology companies in 2016 and 2017—among them Rogers Communications, Celestica, Constellation Software, and Softchoice—are based in Toronto.²⁹

IBM partnered in 2017 with the Ontario government through the Ontario Centres of Excellence on the C\$47 million IBM Innovation Incubator project, to provide cloud computing and big data analytics capability at incubators in four Ottawa and Toronto areas—Bayview Yards in

Ottawa, Ryerson University's DMZ and MaRS Discovery District in Toronto, Communitel in Waterloo, and ventureLAB in Markham—serving more than 250 startups initially.³⁰ A General Motors Canadian Technical Center in Markham opened in January 2018 and will employ up to 700 engineers in autonomous vehicle R&D. GM already had a tech center in Oshawa and an innovation lab near the University of Waterloo.³¹ Uber opened its Toronto Advanced Technologies Group Research & Development Centre in 2017, and in September 2018 announced a planned C\$200 million investment to expand the Centre and open a new engineering hub in Toronto.³² Uber is also a platinum level industry sponsor of Toronto's Vector Institute, which focuses on artificial intelligence uses and the transformative potential of deep learning and machine learning.³³

In 2004, the province-funded **Ontario Centres of Excellence (OCE)** brought together seven independent centers across the province in a coordinated initiative to bridge the communication gap between Ontario's college, university, and hospital research community and private industry. The goal was to drive commercialization of research. Today, OCE deploys a team of 40 business development managers across the province to match industry needs with cutting-edge research, and then recruit, train, and provide early-stage funding to entrepreneurs developing commercial solutions.³⁴

OCE programs cover R&D across a range of industries and technologies, among them agri-food, cleantech, automotive parts sourcing, autonomous vehicles, fintech cybersecurity, 5G technology, and health care. For example, it is one of the three provincial coordinators of ENCQOR (Evolution of Networked services through a Corridor in Québec and Ontario for Research and innovation), a C\$400 million initiative that partners Ontario, Quebec, and the federal government with Ericsson, Ciena, Thales, IBM, and CGI to focus on research and innovation in 5G disruptive wireless technologies that will transform the capabilities of SMEs to innovate and compete in the global marketplace.³⁵ Since 2013, OCE has supported more than 2,500 companies and funded more than 3,500 projects in 160 Ontario communities.³⁶

This high level of public investment, coupled with corporate investment, has proved effective. Toronto currently ranks among the top cities in the world (#37) in the Global Innovation Index 2018 ranking for science and technology clusters.³⁷ One manifestation of this is the Toronto Discovery District, a research cluster in the city's downtown that includes the University of Toronto's main campus and five major hospitals focusing on medical research. A key fixture forming the heart the Toronto Discovery District is the MaRS Discovery District, the world's largest urban innovation hub and facilities complex, providing research facilities, startup spaces, science labs, and corporate offices.³⁸ MaRS is a non-profit organization that pioneered the urban innovation hub concept to give "entrepreneurs what they need most: a home with access to networks and capital."³⁹ Its name is derived from its original emphasis on "Medical and Related Sciences." Today, however, it connects tech entrepreneurs from many fields with established businesses to exchange ideas, test and prototype concepts, and collaborate.

With the addition of a second tower in 2015, MaRS Discovery District now offers 1.5 million square feet of lab, research, and office space for corporations, startups, and venture investors. Both towers are now fully occupied, and MaRS announced in September 2018 that it will partner with the University of Toronto to open another 24,000 square feet of office space along Toronto's waterfront in the planned Waterfront Innovation Centre complex to be completed in 2021.⁴⁰ Over 2008–2017, MaRS-supported ventures have raised a combined C\$4.8 billion and generated C\$3.1 billion in revenues; they employed nearly 13,000 people in 2017.⁴¹ Among the corporate multi-year pledge donors to MaRS are Cisco Canada, Microsoft Canada, and KPMG; public-sector founding supporters include the Government of Ontario, the Government of Canada, and the University of Toronto, and Ontario Trillium Foundation, an agency of the Government of Ontario, is also a multi-year pledge donor.⁴² Larger tenants in the MaRS Discovery District include Autodesk, Airbnb, Real Ventures, the Vector Institute, Johnson & Johnson's JLABS@Toronto, CIFAR, Royal Bank of Canada, National Research Council of Canada–Industrial Research Assistance Program, Merck, and Samsung.⁴³

Toronto is also Canada's leading center for manufacturing, and as manufacturing companies have become increasingly tech-reliant—through 3D printing, robotics, machine learning, and IoT—they are finding expertise and skilled workers close to home. Here, the superclusters play a vital role. "The traditional way that national and provincial governments have supported innovation is by making significant investment in early stage, and then pushing it into the marketplace," explains Jayson Myers, CEO of Next Generation Manufacturing Canada (NGen), the Ontario-based manufacturing supercluster. "That's led to a vibrant startup community, but the challenge has been to grow the startups and commercialize the IP. The supercluster approach is different—to help fund where industry wants to put its money in innovation projects. In six months, we raised C\$600 million because companies wanted to advance their projects, not a researcher's project."⁴⁴

Part of the problem is that the manufacturing and tech sectors are often simply unaware of each other. "There's a gap between tech companies and industry,"

Myers says. "Growth in industry comes from applying technologies, but there's a gap in the deployment of technology in manufacturing." At the same time, he adds, "a lot of great manufacturing companies are doing 99% of their sales outside of Canada so, for example, IoT companies developing sensors may send the manufacturing work to Taiwan when partners may be located just down the road. Our objective is to build collaboration inside Canada by connecting manufacturers with tech companies they may not be aware of." This, in turn, provides Canadian tech startups with added opportunities to pursue organic growth within Canada.

NGen also works with VCs and banks in Canada to identify commercializable opportunities, taking a syndicated funding approach involving granting councils, federal agencies, banks, and VCs. Projects have to involve at least one manufacturer and one technology company, and must demonstrate that they are transformative, that they have clear commercial potential, and that they contribute to the manufacturing ecosystem through training, IP, or other benefits.



Quayside neighborhood plan, Toronto

SPOTLIGHT

A 12-Acre Smart City on the Toronto Waterfront

Google parent Alphabet's urban design unit Sidewalk Labs released a draft site plan in November 2018 for Quayside, a 12-acre planned neighborhood on public land along the Toronto waterfront. Sidewalk Toronto, a public-private partnership formed between Sidewalk Labs and government appointed non-profit developer Waterfront Toronto, began the project in 2016 and is using a novel approach to applying best urban planning practices and new technologies in a "smart city" model.

The Quayside model imagines construction of 2,500 residential units for an estimated 5,000 residents. The project will be 68% housing, 20% commercial, and 12% flexible lower floors—with high ceilings for mezzanine levels and movable walls, digital power sources, and sprinkler systems—for adaptive build-out as retail, production, arts, or community spaces.

The project will be the largest-scale use to date of mass timber construction—using heavy timber supports and pre-fab engineered wood panels—including two 30-story towers, a record height for tall wood buildings. Sidewalk plans to develop digital building information models for mass timber design options (along with cost and time estimates) that can be transmitted directly to a manufacturer for off-site production, speeding construction and reducing waste.

Green building standards, solar power and geothermal heating, energy management

systems, and sewer heat recovery are targeting a 75–80% reduction in greenhouse gas emissions. Quayside is designed to be pedestrian, bicycle, and transit-focused, with curb-free sidewalks and easy connections to the city's light rail system. Smart streets will collect real-time traffic data, coordinate flows of people and vehicles, and allow for a smooth transition in the future to autonomous transportation. Waste removal and last-mile freight consolidation and delivery will be diverted to automated collection and distribution systems operating in below-ground tunnels.

Quayside has not been without controversy, with debate over the way the project was awarded, the business model behind it, and issues around ownership and management of the massive amounts of data gathered in a connected city through IoT and machine learning about residents' movements and habits.

On the data issues, Sidewalk Labs has proposed placing "urban data" collected from the community's physical environment under an independent Civic Data Trust, where it would not be proprietary to anyone, including Sidewalk. Anyone wanting to collect or use data would have to go through a public Responsible Data Impact Assessment (RDIA) process. Sidewalk has further pledged to use open standards for the digital infrastructure and services it provides and allow full access to potential competitors.

EXHIBIT 22

In 2018, a \$100 million funding round for AI-powered search technologies provider Coveo placed Quebec City in the top five Canadian VC markets for the first time.

Largest VC Deals in Top Canada Markets, Q3 2017 to Q2 2018

Toronto	Qtr.	\$M	Montréal	Qtr.	\$M	Vancouver	Qtr.	\$M
Ritual Technologies	Q2'18	\$70	Enerkem	Q1'18	\$224	ACL Services	Q4'17	\$39
ecobee	Q1'18	\$61	Lightspeed POS	Q4'17	\$136	1QBit Information Technologies	Q4'17	\$35
TouchBistro	Q2'18	\$54	eStructure Data Centers	Q1'18	\$80	Elastic Path Software	Q2'18	\$32
Wealthsimple	Q1'18	\$51	Milestone Pharmaceuticals	Q3'17	\$55	BuildDirect	Q1'18	\$28
Wattpad	Q1'18	\$51	Breather	Q2'18	\$46	Kindred Systems	Q4'17	\$28

Calgary	Qtr.	\$M	Québec City	Qtr.	\$M
Greengate Power	Q2'18	\$78	LeddarTech	Q3'17	\$101
Absorb Software	Q3'17	\$59	Coveo	Q2'18	\$100
Circle Cardiovascular Imaging	Q2'18	\$12	La Maison Simons	Q2'18	\$21
Ambyint	Q3'17	\$11	Poka	Q1'18	\$8
Veerum	Q2'18	\$3	XpertSea	Q2'18	\$8

Source: PwC / CB Insights MoneyTree Canada Report, Q2 2018 (all figures in US\$)

Quebec’s provincial economy has improved steadily since early 2016, with unemployment down from 7.6% then⁴⁵ to 5.4% in 2018,⁴⁶ driven in part by a weaker dollar and growing tourism and exports. But beyond that, the province, historically a tech leader in aerospace, has built its capabilities in artificial intelligence, information and communications technology (ICT), multimedia, and video gaming. Current real estate trends make Quebec an affordable alternative to Toronto for lab and office space and for housing.

Montreal saw 3.6% employment growth in 2017, the strongest among 20 North American cities tracked in a study by investment promotion group Montreal International. The city added 75,000 jobs, with the highest growth rates, 6–8%, in tech-reliant sectors such

as information and culture, finance, and professional, scientific, and technical services.⁴⁷ The city is a major hub for artificial intelligence, in part due to the talent pool of more than 250 researchers at the University of Montreal and McGill University and 11,000 university students in AI and Data related programs.⁴⁸ The two schools have received C\$93.5 million and C\$84 million, respectively, from the Canada First Research Excellence Fund for AI research. **Facebook AI Research**, Alphabet-owned **DeepMind Technologies**, and Microsoft acquisition **Maluuba** are all based in Montreal, as are software solutions provider **Element AI**, voice and language recognition solutions provider **Fluent AI**, and AI marketing platform developer **Automat**,⁴⁹ and Quebec City-based AI-powered intuitive search firm **Coveo** has a major presence there.⁵⁰

Facebook has invested US\$7 million for AI research through CIFAR and the **Montreal Institute for Learning Algorithms (MILA)**.⁵¹ **Microsoft** will award grants of US\$6 million and US\$1 million over five years to the University of Montreal and McGill University, respectively.⁵² The VC arms of Microsoft, **Intel** and **Nvidia** have joined Canadian investors in a US\$102 million Series A round for Element AI, which was co-founded by University of Montreal computer science professor and early deep learning innovator Yoshua Bengio.⁵³ **Google** is investing C\$4.5 million over three years in MILA.

Montreal is also a leader in information and communications technology (ICT). Some 5,200 ICT companies in the greater Montreal area employ more than 107,000 workers. Among the leading domestic companies are IT systems integration and solutions firm CGI Group, multimedia entertainment studio Moment Factory, and video game developer Ubisoft.⁵⁴ The city is the world's fifth largest gaming hub after Tokyo, London, San Francisco and Austin, with more than 230 companies across Quebec and a workforce of around 10,000, according to Investissement Quebec.⁵⁵

Other innovative companies based in Montreal include Lion Electric, a manufacturer of all-electric trucks and busses; Enerkem, whose technology converts non-recyclable garbage into cellulosic ethanol, biomethanol, and recyclable chemicals; and **IVADO (Institute for Data Valorization)**, a data management enterprise that links scientific researchers with industry in the fields of data science and artificial intelligence.

The province of Quebec is investing C\$100 million through 2022 to create its a Quebec AI research cluster, and Quebec will also share in C\$40 million in federal funding across Canada for the Pan-Canadian Artificial Intelligence Strategy.⁵⁶ Separately, Quebec City has begun to attract entrepreneurial talent and venture investment, notably in emerging technologies like AI, fintech, and internet-of-things. A significant recent Q2 2018 investment highlighted in PwC/CB Insights' MoneyTree report was a US\$100 million funding round for Coveo, which placed Quebec City in the top five Canadian VC markets for the first time in the report's history. In Q2 2018, Quebec City firms raised US\$147 million in five deals; in Q3 2017 they raised US\$101 million in two deals.

Those two quarters represent the first significant VC deal activity for Quebec City, and future growth prospects for the city's tech ecosystem are bright.⁵⁷

British Columbia's tech community comprised more than 10,000 companies in 2016, the latest year for which data is available from BC Stats, up 3.3% from the year before. The sector employed more than 106,000 people (up 4.1%), generating annual revenue of C\$28.9 billion (up 9.2%), and contributing nearly C\$14.6 billion to GDP (up 3.5%). It should be noted that BC employs more workers in tech than in oil, gas, forestry, and related manufacturing combined. In 2016, average weekly wages for BC tech employees were nearly twice the average for all workers in the province.⁵⁸ BC tech firms attracted C\$646 million in VC investment across 91 deals in 2017, according to Trade and Invest British Columbia.⁵⁹

Most (93%) of BC's high tech businesses are in the services sector, and well over half of them are located in Greater Vancouver.⁶⁰ BC's high tech ecosystem is also characterized by small firms more than large, with 81% of companies employing fewer than 10 people.⁶¹ BC is home to a quarter of Canada's video and online game developers,⁶² and a similar share of its cleantech sector.⁶³

Major companies with a presence in Vancouver include Microsoft, Amazon, Intel, customer intelligence software designer Vision Critical, online building supply marketplace BuildDirect, audit/compliance software firm ACL, social media management platform Hootsuite, and data management and analytics provider Tableau Software. Telecom equipment maker Sierra Wireless is headquartered in the nearby suburb of Richmond.⁶⁴

In February 2018, the Ministry of Innovation, Science and Economic Development selected five superclusters across Canada to receive a total of C\$950 million to build regional technology ecosystems that are expected to create an estimated 50,000 jobs and grow the Canadian economy by C\$50 billion.⁶⁵ BC's Digital Technology Supercluster will invest in industry-led collaborative projects to improve service delivery in the natural resources, precision health, and manufacturing sectors, building on the province's strengths in data management and analytics, quantum computing, and virtual and augmented reality imaging.⁶⁶ Support

comes not only from the federal government, but also BC's provincial government, industry, and academia— anchored by the University of British Columbia. Projects already announced⁶⁷ include

- a secure, private Health and Genomics Platform that will enable physicians and researchers to develop personalized cancer treatments based on a patient's unique genetic makeup;
- an Earth Data Store that will allow the collection, sharing and visual presentation of resource data for project proponents, government agencies, and community stakeholders; and
- a Digital Learning Factory that uses AI to create virtual environments for cost-effective design, experimentation, prototyping, and testing in manufacturing.

Founding member Iain Evans describes the Supercluster as a catalytic organization, inspired by US models such as DARPA and ARPA-E, and by organizations such as SRI and Xerox Parc in the Bay Area that have been successful at stimulating connections and unlocking capital between organizations. Evans believes that BC has strong capacities that can be leveraged to support a range of industries, helping large companies but also enabling more small and medium enterprises to grow and scale at home. He also points to important connections with California and Silicon Valley: "Besides providing models for how to build capacity, the Valley also serves as an important market where systems and ideas first developed in BC can be adopted." In quantum computing, for example, D-Wave Systems, which developed the first commercial quantum computer, counts among its major installations a collaboratively-funded quantum computing system housed at the Ames Research Center in Silicon Valley. Evans notes that "the Valley's purchasing power is important, as its companies and organizations are sophisticated early adopters. Other places don't yet have the kinds of ecosystems that can enable you to move advanced technologies to market as quickly."⁶⁸

D-Wave Executive Vice President Warren Wall confirms, "Going to California to engage with visionary companies was key. These aren't the kinds of companies you can find in Canada, so being in Silicon Valley is important." In a three-way collaboration between Google, NASA,

and USRA (Universities Space Research Association), D-Wave's computer is currently installed at the NASA Advanced Supercomputing Facility at NASA's Ames Research Center.⁶⁹ Lockheed Martin funded D-Wave's first commercial quantum computer installation at USC's Information Sciences Institute.⁷⁰ Another Vancouver quantum computing company, 1QBit, recognized as a global Technology Pioneer by the World Economic Forum, produces quantum computing software, initially built for D-Wave's platform. Wall sees an opportunity to build a world-leading quantum computing ecosystem in Canada through collaborations with government, academia, and industry, if the effort moves quickly to take advantage of a first-mover position. Though still in its infancy, but with digital computing approaching its limits, companies and governments around the world are increasingly focused on quantum as the next stage of evolution in computing.⁷¹

Besides quantum computing, other fields where collaboration with California is strong and people move fluidly up and down the West Coast include film and digital media, AI and machine learning, cleantech, advanced materials manufacturing (simulation and digital modeling of advanced materials such as carbon fiber composites) and, most recently, cryptocurrency.

The provincial government helps fund work-integrated learning programs and lab facilities at BC's six research universities—**University of British Columbia, Simon Fraser University, University of North British Columbia, University of Victoria, Royal Roads University, and Thompson Rivers University**. Since 2011, these institutions have increased post-graduate positions in engineering and computer science by 35%, and the province in January 2018 committed to funding 2,900 more spaces tied to high-skilled workforce needs, which will add 1,000 graduates by 2023.⁷²

The BC Innovation Council (Innovate BC) is a network of accelerators, academic institutions, and industry groups established to help startups access public and private funding, launch their ideas, and connect with experts and mentors. It hosts an annual BCTech Summit and has awarded more than C\$4 million in Ignite matching grants on behalf of the **National Resources and Applied Sciences (NRAS) Endowment Fund** since 2016. The four research project winners for 2018 were **Ionomr**, for an anion exchange membrane used in wastewater treatment; **Delta-Q Technologies** and

Terella Energy Systems, for cooling solutions for high-energy electric vehicle batteries; **Terramera**, for its work on safer plant-based pesticides; and **Performance Filaments**, for its process to produce lightweight thermoplastics for automotive and sporting goods uses from nanocellulose wood pulp derivatives.⁷³

Innovate BC teams with non-profit **New Ventures BC** each year to award C\$275,000 in cash and prizes to early-stage startups. New Ventures also runs an accelerator program. Ventures reaching the top 25 in the 2012–2014 competitions have had a 79% survival rate, created a combined 930 jobs, and raised a combined C\$92 million in funding.⁷⁴ The competition's 2018 winners included **Volta Air**, a designer of zero-emissions electric refrigeration units for urban delivery vans; **Cyberdantics**, which is developing an advanced dental drill; and **Medimap**, which is reducing wait times at walk-in clinics.⁷⁵

Since 2016, the BC tech community has voiced concerns that sector growth is outpacing the supply of STEM graduates and skilled talent. On the one hand, a broader mix of companies of all sizes, plus the arrival of global tech firms, has had a stabilizing influence, but it has also heightened competition for talent and priced smaller entrepreneurs out of the market. Similarly, Toronto-area entrepreneurs worry that the rush to build global clusters is coming at the expense of local entrepreneurs, bidding up rents for work space and housing, and stifling the incubator and early-stage VC ecosystem. The federal and provincial governments across Canada, especially in high-demand areas like Vancouver and Toronto, find themselves walking a fine line as they try to attract global talent, nurture and protect local innovation, and diversify regional economies. Their solution so far has been to invest, as strategically as possible, in growing the market for all.

One challenge that initiatives such as the Digital Supercluster, Innovate BC, and New Ventures BC confront and seek to address is the fact that while BC is strong in digital technologies, most companies are small and relatively few grow to be mid-size, which causes many to move south (to Washington state and California) and East (to places like Toronto). Being relatively isolated, Vancouver also lacks a capital base like Toronto's. The Supercluster in particular is designed to grow a stronger center of gravity on the West Coast.

This forward investment by Canada's federal government, provinces, and cities is producing results, as seen in growing venture activity. In 2018, aggregate venture investment reached a record high, with Canadian companies raising US\$3.5 billion across 471 deals. Funding and deal count were up 35% and 30% respectively. Growth was spread across Canada's three major startup and technology centers, with Montreal-based companies raising US\$861 million, a 29% increase from 2017; Toronto-based companies raising US\$1.3 billion, a 47% jump over 2017; and companies in Vancouver raising US\$388 million, a 14% increase from the previous year.⁷⁶

Overall, there is growing energy inside Canada's startup ecosystem. A survey conducted by Silicon Valley Bank (SVB) for its Canada Startup Outlook 2019 report⁷⁷ found that

- 56% of startups surveyed said they expect 2019 to be better than 2018;
- 64% percent had successfully raised capital in 2018;
- 56% said their realistic long-term goal is to be acquired, with 86% expecting the 2019 M&A market to match or surpass 2018 levels; and
- 84% said they expect to grow their workforce in 2019.

In contrast to the United States where government's role is minimal, government support plays a significant role for many Canadian startups. The SVB survey found that

- 6 in 10 have received government benefits designed to support the innovation economy; and
- the most commonly used programs are the Scientific Research and Experimental Development tax incentive (48%), the Global Skills Strategy/Global Talent Stream (13%), and the Start-up Visa Program (10%).

The major challenges Canadian startups face are common to startups globally:

- finding investment capital (8 in 10 of the startups surveyed by SVB said the current fundraising environment is extremely or somewhat challenging); and
- finding people with the right skills to grow their businesses (89% of the surveyed startups said finding talent with the necessary skills was extremely or somewhat challenging).

A Tale of Two Visas

Foreign-born founders of startup ventures occupy a gray area of immigration law somewhere between the well-established visa categories of sponsored workers with specialized skills and investors. They are owners, employers, and employees with no clear sponsorship. Their businesses are not fully funded and are in early-stage development. Prospects for business success and job creation are speculative and the risk of failure is high.

Approaches to visa policy taken by various countries to support immigrant entrepreneurial talent while mitigating risk will determine their ability to attract talent and innovation in a highly competitive global market. The contrasting US and Canadian experiences, given the two countries' proximity and shared border, are instructive.

Silicon Valley has grappled for decades with issues surrounding immigration, in particular (1) securing H-1B visas for skilled engineers and programmers entering the US as contract employees to address shortages and mismatched skills in the US workforce; and (2) creating a simple, clear pathway for STEM graduates with advanced degrees from US universities to attain permanent residence in the US and pursue careers with established companies or start businesses of their own.

Aspiring entrepreneurs already in the US under specialty occupation or student visas face a maze of less-than-satisfactory temporary training or employment-based (EB) visa options as they raise capital and launch their startup ventures with no certainty of permanent residence or ability to work. That, in turn, affects life decisions from buying a home to starting a family. The alternative is to return to their home countries for a specified period and then reapply for permanent residence, at this point a likely 15-year process due to application backlogs. As more countries develop tech hubs and offer competitive incentives, and as home country opportunities open up in China, India, and elsewhere, the lure of Silicon Valley can no longer be taken for granted.

Comprehensive immigration reform in the US has been held captive by a contentious political debate pitting border security and "merit-based" immigration against a

streamlined visa process, higher visa caps to work through the existing backlog, targeted employment-based incentives, and a continued commitment to accepting families and refugees. While these goals are not mutually exclusive, each piece has become a bargaining chip that one side has been unwilling to relinquish.

Successive legislative attempts over 2011–2013 to carve out a visa category for entrepreneurs never passed out of committee for a full House or Senate vote. A baseline 2011 startup visa proposal established a two-year process that would, on completion, offer a path to permanent residence. It established three categories of eligibility:

- founders who had already secured at least \$100,000 in qualified venture or angel investment;
- H-1B visa holders or STEM graduates with demonstrated annual income and assets to remain in the US and at least \$20,000 in upfront investment or government grants; and
- owners with a controlling interest in a foreign firm that has generated at least \$100,000 in US revenues in the previous year.

Once approved, entrepreneurs would have to meet minimum thresholds over the two-year visa period for additional investment raised, revenues generated, and jobs created in the US. Subsequent House and Senate versions required investor sponsorship for entrepreneurs, lengthened the visa process to five years, created a separate STEM visa offering graduates a path to permanent residence, eliminated per-country caps for employment-based visas, and offered R&D and capital gains tax incentives.

After three failed attempts, the Obama Administration crafted a temporary solution by executive order in 2014, The International Entrepreneur Parole (IEP). The IEP expanded an underused Immigration and Naturalization Act rule allowing temporary "parole"—entry to the US—for "urgent humanitarian reasons or significant public benefit." Originally intended for refugees in certain limited situations, the IEP applied the significant public benefit standard to offer a 30-month stay, renewable once for another 30 months, for a total of five years. It capped available visas at just under 3,000, the number of unused slots under the original rule. Even after parole

approval by US Citizenship and Immigration Services (USCIS), applicants must separately obtain approvals for admission into the US and permission to work. At the end of the five-year process, there is no defined path to permanent residency.

An eligible entrepreneur must have at least a 10% ownership stake in an established startup and an active and essential role in the startup's operations and future growth, and must have secured in advance at least \$250,000 from a qualified venture investor, angel investor, or accelerator, or at least \$100,000 in government grants. Over the initial 30-month parole period, the startup must raise a minimum \$500,000 in additional investment, generate a minimum \$500,000 in revenue, and create at least five jobs, all in the US.

Regulations were finalized in late 2016, with implementation deferred until 2017, after the national elections. The incoming Trump Administration, however, announced its intention to eliminate IEP, arguing that the Obama Administration overreached in expanding the original rule and that immigration policy should be legislated by Congress. By that time, however, a number of applications had been submitted. Responding to a legal challenge on behalf of applicants by the National Venture Capital Association, a federal judge ruled that pending applications were lawful and must be processed. In 2018, the IEP remained in effect, but due to its restrictive terms and uncertain future, only 12 applications were submitted.⁷⁸

A bipartisan Startup Act introduced in the Senate in 2017 as an alternative to the IEP would have, among various provisions, directed federal funds to support commercialization of university research and regional commercialization strategies, established an entrepreneurial visa for up to 75,000 qualified immigrants and a STEM visa for up to 50,000 qualified US-educated graduates, and eliminated per-country caps on EB visas. A competing Senate bill proposed eliminating per-country caps for employment-based visas. Neither bill progressed to a full Senate or House vote.

Canada's **Start-up Visa Program** had a far less troubled history but nonetheless has faced challenges. Launched in 2013 by the Harper government as part of a broad effort to lure global talent, the program was to expire

in 2018 but was made permanent by the Trudeau government in 2017 as part of Immigration, Refugees and Citizenship Canada (IRCC) policy.

Here, the major obstacle has been the government's determination that it did not have sufficient resources or technical expertise to evaluate applicants' proposals. Instead, it required entrepreneurs to first establish their eligibility to apply by pitching an idea or business plan to designated Canadian venture investors, angel investors, or startup business incubators from a government-approved list. If persuaded, a designated investor would provide a commitment certificate to IRCC and a letter of support to the applicant, committing to a minimum C\$200,000 VC investment, a minimum C\$75,000 angel investment, or acceptance to a business incubator program. While the visa and permanent residence application process takes less than a year, obtaining the commitment certificate and support letter has taken some applicants 4–5 years.

Qualifying businesses must be majority-owned by the applicant(s) and the sponsoring entity, be actively managed on an ongoing basis by the applicant within Canada, and have an essential part of their operations located in Canada. Applicants must demonstrate proficiency in English or French and have sufficient funds to cover living expenses for a year. Multiple founders can apply as a team; entrepreneurs can bring immediate family, provided they meet the formula requirements for living expenses; spouses and dependent children can work and attend school under separate permits; and permanent residency is still granted even if the business ultimately fails, provided all other commitments have been met. Work permits under the startup visa are in effect for one year while the application for permanent residence (APR) is pending.

Most APRs are processed within a year, although obtaining the initial commitment certificate and letter of support can add months or years to the process. In the Start-up Visa Program's first four years, only 117 people representing 68 companies had received startup visas.⁷⁹

A more widely used program is Canada's expedited visa alternative to the H-1B visa for workers with special skills, the **Global Skills Strategy (GSS)**. Rolled out in June 2017, the GSS offers employers a fast-track,

two-year temporary work visa for skilled workers who fall under the Global Talent Stream (GTS) classification—for unique or highly specialized talent, or in specific fields experiencing domestic labor shortages—that is exempt from recruitment and advertising requirements under the Labor Market Impact Assessment (LMIA). This enables expedited processing within two weeks.

GSS is driven by a clear need: a 2016 Information and Communications Technology Council study estimated that Canada's economy would create 218,000 more tech jobs by 2020 but is not turning out enough graduates to fill that demand. At the time, only 6% of Canadian college graduates in 2015—fewer than 30,000—earned degrees in information and communications technology fields.⁸⁰ A 2017 University of Toronto/Brock University study reported one in four STEM graduates leaving the country for work, including two-thirds of software engineering graduates and 30% each of computer science and computer engineering graduates; 82% of those leaving relocated to the US, mainly California, New York, and Washington. The main reasons for leaving were 20–30% higher salaries to help pay off student debt, prestige firms, and broader choices and scope of work.⁸¹

The GSS and the Express Entry visa program begun in 2015 set an attraction and retention goal of 250,000 skilled tech workers over 2018–2022. Visa uncertainties, coupled with a high cost of living and other factors,

appear to be changing the calculations made by tech workers and employers. In its first 10 weeks, the GSS fast-track visa lured 1,600 foreign hires.⁸² Within one year, more than 12,000 people had applied and 95% were accepted.⁸³

A March 2018 MaRS Discovery District innovation hub survey of 55 Toronto-area tech companies with more than C\$1 million in annual revenues and with US and international market exposure revealed that more than half of the companies saw a marked increase in international applicants in 2017 over 2016; 45% made international hires. The new hires came predominantly from the US, with significant numbers also coming from India, China, Brazil, and the UK; 35% of the companies responding to the survey reported using the expedited GSS visa to hire.⁸⁴

This flow of international talent into Canada aligns closely with Canadian public opinion, which broadly supports immigration as a contributor to the economy. In the 2018 Global Attitudes Survey by the Pew Research Center, 65% of Canadian respondents supported the proposition that “Immigrants today make our country stronger because of their work and talents,” whereas only 27% agreed with the proposition “Immigrants today are a burden on our country because they take our jobs and social benefits.” This places Canada at the top of the list of 18 countries surveyed for positive attitudes toward immigration.⁸⁵



Conclusion: Building Synergy and Alignment

The Bay Area, with California, enjoys distinct synergies with Canada that serve to align the two economies. Public investment in science across Canada, and in key provinces and cities, has helped make Canada a research leader in AI and other disciplines. This, in turn, has generated a skilled and talented workforce with a strong entrepreneurial and technical base. These assets, and generally lower costs, support innovation and an active entrepreneurial ecosystem. That, plus growing access to venture capital, is enabling more startups to grow in Canada, including migrants from the Bay Area. Leading Bay Area technology companies are also establishing headquarters and research operations in Canada, and particularly in Toronto, to take advantage of local talent and research capabilities.

At the same time, the Bay Area continues to attract entrepreneurial, managerial, and scientific talent from Canada. This happens through the region's research universities, but particularly due to its status as the world's leading technology, innovation, and entrepreneurial platform. Not only is venture capital available at scale, but the region provides an unparalleled base from which emerging companies can compete and grow to global scale. The result is a two-way flow of talent and technology from which both benefit.

Canada is also present in the Bay Area to participate in the conversations that will help shape the future

of the innovation economy, particularly around technology and digitization. In this respect, the Bay Area's importance has grown, not just as a global technology and innovation platform, but also as a global center of thought leadership on technology-driven change. Beyond university and other programs, this is exemplified in the World Economic Forum's Center for the Fourth Industrial Revolution, which operates from San Francisco's Presidio and engages business, government, and civil society leaders in dialogues around innovative approaches to policy and governance. Participation by governments such as Canada's provides an opportunity to anticipate change and shape its processes.

This is supported by a broader alignment of interests and values that extends to California as a whole. Supported by NAFTA and the recently-negotiated US-Mexico-Canada Agreement (USMCA), Canada is the state's second largest trading partner worldwide, behind Mexico and just ahead of China. It also shares a common commitment with California to accelerate progress toward a low-carbon economy and address the challenge of climate change. Quebec's cap-and-trade system is linked to California's through the Western Climate Initiative (WCI), which it joined in 2008. That system, which links the province's carbon market with California's, is now the centerpiece of Quebec's 2013–2020 Climate Change Action Plan.

Notes

CHAPTER 1

Canada's Economy: Growth and Transition

- 1 "Amadeo, Kimberly, "Canada Economy Facts and Outlook," The Balance, November 26, 2018, <https://www.thebalance.com/canada-economy-facts-and-outlook-3306344>.
- 2 "Economic Accounts," Canada Yearbook, Statistics Canada, 2011, <https://www150.statcan.gc.ca/n1/pub/11-402-x/2011000/chap/econo/econo-eng.htm>.
- 3 McDonald, Ryan and Rispoli, Luke, "How big was the Effect of Falling Commodity Prices on Canadian Real Incomes between mid-2014 and mid-2016?" Economic Insights, Economic Analysis Division, Statistics Canada, December 22, 2016, <https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2016066-eng.htm>.
- 4 "Monetary Policy Report," Bank of Canada, January 2019, <https://www.bankofcanada.ca/wp-content/uploads/2019/01/mpr-2019-01-09.pdf>.
- 5 "Canada Unemployment Rate Falls to 5.9%, Lowest Since 2008," Trading Economics, December 1, 2017, <https://tradingeconomics.com/articles/12012017135408.htm>.
- 6 "Canada Unemployment Rate," Trading Economics, accessed February 27, 2019, <https://tradingeconomics.com/canada/unemployment-rate>
- 7 "Some provinces now face the downside of tight labour markets," Provincial Outlook, Royal Bank of Canada, September 12, 2018, <http://www.rbc.com/economics/economic-reports/pdf/provincial-forecasts/provfst-sep2018.pdf>.
- 8 Interview with Trevin Stratton, Chief Economist, Canadian Chamber of Commerce, Fall 2018.
- 9 Connolly, Joannah, "Real estate industries made up fifth of Canada's GDP in 2017," Vancouver Courier, March 5, 2018, <https://www.vancourier.com/real-estate/real-estate-industries-made-up-fifth-of-canada-s-gdp-in-2017-1.23191899>.
- 10 Ligaya, Armina, "Bank of Canada raises qualifying mortgage rate after Big Six banks hike rates," Financial Post, May 9, 2018, <https://business.financialpost.com/real-estate/mortgages/central-bank-raises-key-metric-used-to-determine-mortgage-eligibility>.
- 11 Giovanetti, Justin and Mahoney, Jill, "Toronto housing market feels effect of foreign buyers tax," Globe and Mail, September 14, 2017, <https://www.theglobeandmail.com/news/national/toronto-housing-market-feels-effect-of-foreign-buyers-tax/article36258711/>.
- 12 "BC's New Real Estate Taxes: What you need to know!" BradMaclaren.com, March 2, 2018, <http://bradmaclaren.com/bcs-new-real-estate-taxes-need-know/>
- 13 "Emerging Trends in Real Estate: Canada and the United States 2018," PwC/Urban Land Institute, 2018, https://www.pwc.com/ca/en/real-estate/assets/Real_Estate_ETRE_2018_PDF.pdf?utm_source=report&utm_medium=referral&utm_campaign=2018-etre.
- 14 Ibid.
- 15 O'Brien, Frank, "Vancouver versus Toronto: a tale of two office sectors," Business in Vancouver, November 21, 2018, <https://biv.com/article/2018/11/vancouver-versus-toronto-tale-two-office-sectors>.
- 16 Toneguzzi, Mario, "Calgary's office vacancy rate the highest in Canada," Calgary's Business, TroyMedia.com, August 16, 2018, <http://troymedia.com/2018/08/16/calgary-office-vacancy-rate/>.
- 17 "Canada's Manufacturing Sector," Canadian Manufacturing Sector Gateway, Government of Canada, February 15, 2019, <https://www.ic.gc.ca/eic/site/mfg-fab.nsf/eng/home>.
- 18 "Automotive Sector," Invest in Canada, Winter 2018, <https://www.international.gc.ca/investors-investisseurs/assets/pdfs/download/vp-automotive.pdf>.
- 19 "Potential U.S. auto import tariffs: the view from Canada," Royal Bank of Canada, June 26, 2018, http://www.rbc.com/economics/economic-reports/pdf/other-reports/USautotariffs_June2018.pdf.
- 20 "Provincial Economic Profile: Ontario," IBISWorld, October 2018, <https://www.ibisworld.com/industry-insider/white-papers/ontario-economic-profile/registration/>.
- 21 "Automotive Sector," Invest in Canada, Winter 2018, <https://www.international.gc.ca/investors-investisseurs/assets/pdfs/download/vp-automotive.pdf>.
- 22 Chase, Chris, "Canadian Vehicle Production Down In 2017," autoTRADER.ca, January 18, 2018, <https://www.autotrader.ca/newsfeatures/20180118/canadian-vehicle-production-down-in-2017/>.
- 23 "Aerospace: Touch Down in the Heart of the Action," Investissement Quebec, accessed March 8, 2019, <https://www.investquebec.com/international/en/industries/aerospace/touch-down-in-the-heart-of-the-action.html>.
- 24 "Governments of Canada and Quebec invest in Quebec's advanced manufacturing sector," Innovation, Science and Economic Development Canada ministry news release, June 28, 2018, <https://www.newswire.ca/news-releases/governments-of-canada-and-quebec-invest-in-quebecs-advanced-manufacturing-sector-686851181.html>.
- 25 "Nova Scotia Demographic—Economic Outlook 2011–2021," Canmac Economic Limited, April 2012, <http://canmac.com/Nova%20Scotia%20Demographic%20-%20Economic%20Outlook%202011%20-%202021.pdf>.
- 26 "Manufacturers' Outlook 2018," Plant Magazine/Grant Thornton/Syspro/Machines Italia annual survey, 2018, https://www.grantthornton.ca/globalassets/1.-member-firms/canada/insights/pdfs/2018_manufacturers_outlook.pdf.
- 27 Natural Resources Canada, "Energy and the economy," Government of Canada, September 13, 2018, <https://www.nrcan.gc.ca/energy/facts/energy-economy/20062>
- 28 Natural Resources Canada, "Uranium and nuclear power," Government of Canada, August 24, 2018, <https://www.nrcan.gc.ca/energy/facts/uranium/20070>
- 29 Natural Resources Canada, "Energy and the economy," Government of Canada, September 13, 2018, <https://www.nrcan.gc.ca/energy/facts/energy-economy/20062>
- 30 Ibid.
- 31 "Canadian Economic Contribution," Canadian Association of Petroleum Producers, accessed February 26, 2018, <https://www.capp.ca/canadian-oil-and-natural-gas/canadian-economic-contribution>.
- 32 Natural Resources Canada, "Exploration and Production of Shale and Tight Resources," Government of Canada, August 23, 2016, <https://www.nrcan.gc.ca/energy/sources/shale-tight-resources/17677>.
- 33 Natural Resources Canada, "Canadian LNG Projects," Government of Canada, December 31, 2018, <https://www.nrcan.gc.ca/energy/natural-gas/5683>.
- 34 Gordon, Julie and Jaganathan, Jessica, "Big is back: Canada's mega LNG project gets green light on Asia demand," Reuters, October 1, 2018, <https://www.reuters.com/article/us-canada-lng/big-is-back-canadas-mega-lng-project-gets-green-light-on-asia-demand-idUSKCN1MC0L9>.
- 35 "B.C.'S Future Liquefied Natural Gas Industry Could Fuel Economic and Job Growth in The Province and Canada for Decades," Conference Board of Canada press release, February 29, 2016, https://www.conferenceboard.ca/press/newsrelease/16-02-29/b_c_s_future_liquefied_natural_gas_industry_could_fuel_economic_and_job_growth_in_the_province_and_canada_for_decades.aspx.
- 36 Natural Resources Canada, "Renewable energy facts," Government of Canada, September 12, 2018, <https://www.nrcan.gc.ca/energy/facts/renewable-energy/20069>.
- 37 National Energy Board, "Canada's Renewable Power Land 2017—Energy Market Analysis," Government of Canada, September 13, 2018, <https://www.neb-one.gc.ca/nrg/sttstc/lctrct/rprt/2017cndrnwblpwr/cndnrvvw-eng.html>.
- 38 Natural Resources Canada, "Renewable energy facts," Government of Canada, September 12, 2018, <https://www.nrcan.gc.ca/energy/facts/renewable-energy/20069>.
- 39 National Energy Board, "Canada's Renewable Power Land 2017—Energy Market Analysis," Government of Canada, September 13, 2018, <https://www.neb-one.gc.ca/nrg/sttstc/lctrct/rprt/2017cndrnwblpwr/cndnrvvw-eng.html>.
- 40 Natural Resources Canada News Release, "Canada Supports Nest Wave of Emerging Renewable Power, Government of Canada, January 18, 2018, https://www.canada.ca/en/natural-resources-canada/news/2018/01/canada_supports_nextwaveofemergingrenewablepower.html.
- 41 Ingram, Elizabeth, "DP Energy gets grant to advance tidal project development in Canada," HydroWorld.com, September 21, 2018, <https://www.hydroworld.com/articles/2018/09/dp-energy-gets-grant-to-advance-tidal-project-development-in-canada.html>.
- 42 Weber, Bob, "Canada will meet climate targets despite emissions gap: environment minister," CBC News, March 6, 2018, <https://www.cbc.ca/news/politics/emissions-gap-mckenna-2030-target-1.4563801>
- 43 Zimonjic, Peter and Lunn, Susan, "Canada must reduce emissions from oil sands to meet climate goals," CBC News, December 19, 2017, <https://www.cbc.ca/news/politics/oecd-canada-climate-report-card-1.4455379>.
- 44 Natural Resources Canada, "Minerals and the Economy," Government of Canada, August 10, 2018, <https://www.nrcan.gc.ca/mining-materials/facts/minerals-economy/20529>.
- 45 Ibid.
- 46 Ibid.
- 47 "Toronto on the Global Stage: 2018 Report Card on Canada and Toronto's Financial Services Sector," Conference Board of Canada, December 2018, <https://cdn2.hubspot.net/hubsf/4372260/Toronto%20on%20the%20Global%20Stage%20-%20for%20TFI.pdf>
- 48 "Partners in Growth: 2017 Report Card on Canada and Toronto's Financial Services Sector," Conference Board of Canada, November 2017, <https://www.tfsa.ca/storage/reports/PartnersinGrowth2017.pdf>.
- 49 Ibid.
- 50 "Toronto on the Global Stage: 2018 Report Card on Canada and Toronto's Financial Services Sector," Conference Board of Canada, December 2018, <https://cdn2.hubspot.net/hubsf/4372260/Toronto%20on%20the%20Global%20Stage%20-%20for%20TFI.pdf>.
- 51 "Largest life insurance companies worldwide in 2017, by market capitalization (in billion U.S. dollars)," Statista, 2017, <https://www.statista.com/statistics/376359/largest-life-insurance-companies-by-market-cap/>.
- 52 "Invest in Canada." Global Affairs Canada, Summer 2017, https://www.international.gc.ca/investors-investisseurs/assets/pdfs/download/vp-financial_services.pdf.

CHAPTER 2

Trade: Integrated Markets

- 1 "Canada Market Overview," Export.gov, US Department of Commerce, December 14, 2018, <https://www.export.gov/article?id=Canada-Market-Overview>.
- 2 "Canada: U.S.–Canada Trade Facts." Office of the United States Trade Representative, accessed February 19, 2019, <https://ustr.gov/countries-regions/americas/canada>.
- 3 "Canada" (Country Profile), World Trade Organization, accessed February 27, 2019, "Canada" (Country Profile), World Trade Organization, accessed February 27, 2019, <http://stat.wto.org/CountryProfile/WSDBCountryPFView.aspx?Country=CA>.
- 4 Stanley, Andrew J. "Mapping the U.S.–Canada Energy Relationship," Center for Strategic and International Studies, May 2018, https://csis-prod.s3.amazonaws.com/s3fs-public/publication/180507_Stanley_U.S.CanadaEnergy.pdf?fbWWhKl0BBuNMOelR SolkNQ89Iij7iaz
- 5 Ibid.
- 6 "State Trade Fact Sheets: California (North)," Government of Canada, March 2018, https://international.gc.ca/world-monde/country-pays/united_states-etats_unis/business_fact_sheets-fiches_documentaires_affaires.aspx?lang=eng.
- 7 "USA Trade Online," US Department of Commerce, Bureau of the Census, <https://usatrade.census.gov/index.php>
- 8 "Trading Partner Portal, CalChamber Advocacy," California Chamber of Commerce (2017 data), <https://advocacy.calchamber.com/international/portals/canada/>.
- 9 "State Trade Fact Sheets: California (North)," Government of Canada, March 2018, https://international.gc.ca/world-monde/country-pays/united_states-etats_unis/business_fact_sheets-fiches_documentaires_affaires.aspx?lang=eng.
- 10 Interview with Vincent Gauthier-Doré, Director Business Development USA, Air Canada, March 2019.
- 11 "Canada: U.S.–Canada Trade Facts," Office of the United States Trade Representative, accessed February 19, 2019, <https://ustr.gov/countries-regions/americas/canada>.
- 12 Melnick, Ted and Williams, Aaron, "Is Canada 'ripping us off'? Or is it the best U.S. trade partner?" Washington Post, September 21, 2018, https://www.washingtonpost.com/graphics/2018/business/us-canada-trade-balance/?utm_term=.8a100e165594.
- 13 Ibid.
- 14 "Softwood Lumber: Canadian Reaction to U.S. Duties," CPAC (Canadian Public Affairs Channel), April 25, 2017, <http://www.cpac.ca/en/cpac-in-focus/softwood-lumber-canada-reacts-u-s-duties/>
- 15 McKenna, Barrie, "A guide to understanding the dairy dispute between the U.S. And Canada," The Globe and Mail, April 24, 2017, updated November 12, 2017, <https://www.theglobeandmail.com/report-on-business/a-guide-to-understanding-the-dairy-dispute-between-the-us-andcanada/article34802291/>.
- 16 Daniels, Jeff, "The California wine industry is a big winner in Trump's new trade deal with Canada and Mexico," CNBC, October 2, 2018, <https://www.cnbc.com/2018/10/02/california-wine-achieved-major-win-of-more-access-to-canada-with-usmca-trade-deal.html>
- 17 Pellechia, Thomas, "U.S.–Canada Wine Trade Argument has been Fermenting Since 2015," Forbes, June 14, 2018, <https://www.forbes.com/sites/thomaspellechia/2018/06/14/u-s-canada-wine-trade-argument-has-been-fermenting-since-2015/#372fca561752>.
- 18 Buerkle, Tom, "Bombardier's Win Adds pressure on Boeing to Strike Embraer Deal," New York Times, January 26, 2018, <https://www.nytimes.com/2018/01/26/business/dealbook/bombardier-boeing-embraer.html>.
- 19 Nunes, Ashley, Bombardier just bested Boeing in a trade dispute between the U.S. and Canada. Here's what you need to know," Washington Post, January 29, 2018, https://www.washingtonpost.com/news/monkey-cage/wp/2018/01/29/bombardier-just-bested-boeing-in-a-trade-dispute-between-u-s-and-canada-heres-what-you-need-to-know/?utm_term=.5f56cba26063.
- 20 Gregg, Aaron, "U.S. trade panel strikes down 300 percent tariffs on Canadian jets, dealing a blow to Boeing," Washington Post, January 26, 2018, https://www.washingtonpost.com/news/business/wp/2018/01/26/u-s-trade-panel-strikes-down-300-percent-tariffs-on-canadian-jets-dealing-a-blow-to-boeing/?utm_term=.b8d35ee17467
- 21 "WTO Rules Against Canada in Magazine Flap," Los Angeles Times, March 15, 1997, http://articles.latimes.com/1997-03-15/business/fi-38396_1_sports-illustrated-canada.
- 22 Pramuk, Jacov, Eamon Javers, and David Reid, "Trump administration will put steel and aluminum tariffs on Canada, Mexico, and the EU, CNBC, May 31, 2018, <https://www.cnbc.com/2018/05/31/trump-administration-will-put-steel-and-aluminum-tariffs-on-canada-mexico-and-the-eu.html>.
- 23 Higgins, Sean, "Business to Trump: End steel and aluminum tariffs in wake of US–Canada–Mexico trade deal," Washington Examiner, October 4, 2018, <https://www.washingtonexaminer.com/policy/economy/business-to-trump-end-steel-and-aluminum-tariffs-in-wake-of-us-canada-mexico-trade-deal>.
- 24 Connolly, Amanda, "Here's the final list of Canadian retaliatory tariffs taking effect against Trump on July 1," Global News, June 29, 2018, <https://globalnews.ca/news/4304743/canada-retaliatory-tariffs-final-list-trump-steel-tariffs/>.
- 25 Bryan, Bob, "The US, Canada, and Mexico's new trade pact looks a lot like NAFTA. Here are the key differences between them," Business Insider, November 30, 2018, <https://www.businessinsider.com/us-canada-mexico-trade-deal-usmca-nafta-details-dairy-auto-dispute-resolution-2018-10>.
- 26 Honig, Esther, "Lumber trade dispute and tariffs boost U.S. wood products," Marketplace, American Public Media, September 20, 2018, <https://www.marketplace.org/2018/09/20/economy/lumber-trade-dispute-and-tariffs-boost-us-wood-products>.
- 27 Hoover, Katie and Ian Fergusson, "Softwood Lumber Imports from Canada: Current Issues," Congressional Research Service, April 12, 2018, <https://fas.org/sgp/crs/misc/R42789.pdf>.
- 28 Eavis, Peter, "How Trump's Lumber Tariffs May Have Helped Increase Home Prices," New York Times, June 11, 2018, <https://www.nytimes.com/2018/06/11/business/dealbook/trump-tariffs-canada-lumber.html>
- 29 "Random Lengths Framing Lumber and Structural Panel Composite Prices, by month," Random Lengths, February 1, 2019, <http://www.randomlengths.com/In-Depth/Monthly-Composite-Prices/>.
- 30 Lowney, Brendan K. and Paul Janke, "No, the so-called Trump lumber tariffs will not threaten the U.S. housing recovery," LBM Journal, July 2, 2018, <https://lbjournal.com/no-the-so-called-trump-lumber-tariffs-will-not-threaten-the-u-s-housing-recovery/>.
- 31 "On Lumber, Trump is Listening," NAHB Now, National Association of Home Builders, June 1, 2018, <http://nahbnow.com/2018/06/on-lumber-trump-is-listening/>.
- 32 Interview with Trevin Stratton, Chief Economist, Canadian Chamber of Commerce, Fall 2018.
- 33 "New Train Car Project," Bay Area Rapid Transit, accessed March 12, 2019, <https://www.bart.gov/about/projects/cars>.
- 34 Matier, Phil, "BART's Fleet of the Future Is Already Spending The Present Getting Repaired," CBS SF Bay Area, July 16, 2018, <https://sanfrancisco.cbslocal.com/2018/07/16/new-bart-cars-fleet-future-repairs/>.
- 35 Sernoffsky, Evan, "Rollout for new BART cars bumped back to Thanksgiving," San Francisco Chronicle, October 4, 2017, <https://www.sfchronicle.com/news/article/Rollout-for-new-BART-cars-bumped-back-to-12253656.php>.
- 36 Swan, Rachel, "Shiny new BART trains finally start crossing the bay; agency braces for rising demand," San Francisco Chronicle, October 24, 2018, <https://www.sfchronicle.com/bayarea/article/Shiny-new-BART-trains-start-crossing-the-bay-as-13333291.php?cmpid=gsa-sfgate-result>.

CHAPTER 3

FDI: Interconnected by Investment

- 1 "Canadian Outward/Inward Foreign Direct Investment to/from the World," Asia Pacific Foundation of Canada, <https://www.asiapacific.ca/statistics/investment>.
- 2 "Foreign Direct Investment (FDI): United States," SelectUSA, US Department of Commerce, November 2018, <https://www.selectusa.gov/servlet/servlet.FileDownload?file=015t000000LKSn>.
- 3 "Canada's State of Trade: Trade and Investment Update–2018," Government of Canada, November 19, 2018, https://www.international.gc.ca/gac-amc/publications/economist-economiste/state_of_trade-commerce_international-2018.aspx?lang=eng.
- 4 Argitis, Theophilos, "Foreign direct investment in Canada plunges to the lowest in eight years," Financial Post, March 1, 2018, <https://business.financialpost.com/news/economy/foreign-direct-investment-in-canada-plunges-on-oil-exodus-1>
- 5 Argitis, Theophilos, "Foreign Investment Holds Steady in Canada Despite U.S. Tax Cuts," Bloomberg, August 29, 2018, <https://www.bloomberg.com/news/articles/2018-08-29/canada-2nd-qtr-foreign-direct-investment-drops-on-energy-exodus>.
- 6 "Canada's State of Trade: Trade and Investment Update–2018," Government of Canada, November 19, 2018, https://www.international.gc.ca/gac-amc/publications/economist-economiste/state_of_trade-commerce_international-2018.aspx?lang=eng.
- 7 Budny, Amanda and Ryan Noonan, "New Foreign Investment in the United States, 2017," News release, Bureau of Economic Analysis, US Department of Commerce, July 11, 2018, <https://www.bea.gov/system/files/2018-08/fdi0718rs.pdf>.
- 8 "Foreign Direct Investment (FDI): Canada," SelectUSA, US Department of Commerce, November 2018, <https://www.selectusa.gov/servlet/servlet.FileDownload?file=015t000000LKLr>
- 9 "Foreign Direct Investment in Southern California 2018," World Trade Center of Los Angeles/Los Angeles County Economic Development Corp., May 21, 2018, https://laedc.org/wp-content/uploads/2018/05/WTCLA_2018_FDI-Report.pdf.

- 10 "The Top 10: Investing for Canada on the World Stage," Boston Consulting Group, October 2015, http://files.newswire.ca/29/Infographic_ENG.pdf.
- 11 "Ivanhoé Cambridge establishes presence in the heart of California's Silicon Valley," News release, CDPQ, December 7, 2011, <https://www.cdpq.com/en/news/pressreleases/ivanhoe-cambridge-establishes-presence-in-the-heart-of-californias-silicon>.
- 12 Baker, Karl, "Bloom Energy's Future Hinges on Global Sales and Therefore So Does Delaware Manufacturing," Delaware News Journal, Delaware Online, February 7, 2019, <https://www.delawareonline.com/story/money/business/2019/02/06/bloom-energys-future-hinges-global-sales-and-therefoore-so-does-delaware-manufacturing/2780329002/>.
- 13 FDI Markets database, accessed March 13, 2019, <https://www.fdimarkets.com>.
- 14 Calvey, Mark, "Canadians strike gold in buying California's City National Bank," San Francisco Business Journal, January 22, 2015, <https://www.bizjournals.com/sanfrancisco/blog/2015/01/city-national-bank-royal-bank-canada-cyn-ry-deal.html>.
- 15 Berman, David, "RBC banking on double-digit growth from newly acquired City National," The Globe and Mail, updated May 16, 2018, <https://www.theglobeandmail.com/report-on-business/rbc-banking-on-double-digit-growth-from-newly-acquired-city-national/article30504013/>.
- 16 "Recreational Marijuana: Insights and Opportunities," Deloitte, 2016, https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/Analytics/ca-en-analytics-DELOITTE%20Recreational%20Marijuana%20POV%20-%20ENGLISH%20FINAL_AODA.pdf.
- 17 Bernard-Kuhn, Lisa, "Canadian cannabis companies bullish on US market, boosting cross-border acquisitions and deals," Marijuana Business Daily, October 9, 2018, <https://mjbizdaily.com/canadian-cannabis-companies-bullish-on-us-market-boosting-cross-border-acquisitions-and-deals/>.
- 18 "Captor Capital Corp. Announces Closing of MedMen Investment," News release, Captor Capital Corp., March 29, 2018, <https://globenewswire.com/news-release/2018/03/29/1455602/0/en/Captor-Capital-Corp-Announces-Closing-of-MedMen-Investment.html>.
- 19 Money, Luke, "Costa Mesa Planning Commission awards Permit to 13th marijuana business," Daily Pilot, Los Angeles Times, September 25, 2018, <https://www.latimes.com/social/daily-pilot/news/tn-dpt-me-cm-planning-wrap-20180925-story.html>.
- 20 "Pivot Secures Manufacturing Facility in Costa Mesa, California," Pivot Pharmaceuticals Inc news release, PR Newswire Cision, May 23, 2018, <https://www.prnewswire.com/news-releases/pivot-secures-manufacturing-facility-in-costa-mesa-california-300653486.html>
- 21 "Canada's CannaRoyalty continues California cannabis investment spree," Marijuana Business Daily, April 20, 2018, <https://mjbizdaily.com/canadas-cannaroyalty-continues-california-cannabis-investment-spreee/>.
- 22 "Origin House to Acquire Cub City—Craft Cannabis Production Facility and Operational Team—to Expand Brand Accelerator Program," Origin House news release, PR Newswire Cision, December 4, 2018, <https://www.newswire.ca/news-releases/origin-house-to-acquire-cub-city---craft-cannabis-production-facility-and-operational-team---to-expand-brand-accelerator-program-701867021.html>.
- 23 Narayan, Shwanika and Carolyn Said, "Bay Area marijuana businesses Apothecarium, Harborside in Canada deals," San Francisco Chronicle, February 11, 2019, <https://www.sfchronicle.com/business/article/Bay-Area-marijuana-businesses-Apothecarium-13608312.php>.
- 24 Ibid.
- 25 Itzkowitz, Matthew, "Dear Canada, Enter at Your Own Risk: Legally Smoking Weed in Your Country Can Bar You from Entry into the United States," American University Journal of Gender, Social Policy & the Law, November 11, 2018, <http://www.jgspl.org/dear-canada-enter-at-your-own-risk-legally-smoking-weed-in-your-country-can-bar-you-from-entry-into-the-united-states/>.
- 26 "Chevron Canada," Chevron Canada, accessed March 22, 2019, <https://canada.chevron.com>.
- 27 "Wells Fargo Names Canada Leaders for Equipment Finance and Commercial Distribution Finance," Wells Fargo news release, May 18, 2016, <https://newsroom.wf.com/press-release/leadership-announcements/wells-fargo-names-canada-leaders-equipment-finance-and>.
- 28 "About Wells Fargo Rail," Wells Fargo, accessed March 22, 2019, <https://www.wellsfargo.com/com/financing/equipment-financing/rail/about/>.
- 2 Alperin, Elijah and Jeanne Batalova, "Canadian Immigrants in the United States," Migration Policy Institute, June 2018, <https://www.migrationpolicy.org/article/canadian-immigrants-united-states>.
- 3 "Nortel and the TSE 299," CBC News, August 18, 2000, <https://www.cbc.ca/news/business/nortel-and-the-tse-299-1.230333>.
- 4 "Timeline: Key dates in the history of Nortel," Reuters, January 14, 2009, <https://www.reuters.com/article/us-nortel-timeline-sb/timeline-key-dates-in-the-history-of-nortel-idUS TRE50D3N120090115?pageNumber=1>
- 5 Friend, David, "RIM's rise and fall: A short history of Research in Motion," Global News, January 28, 2013. <https://globalnews.ca/news/384832/rims-rise-and-fall-a-short-history-of-research-in-motion/>
- 6 Dobby, Christine, "Surge in investment shows Canada loves its startups—and so do U.S. investors," Financial Post, December 31, 2012, <https://business.financialpost.com/entrepreneur/fp-startups/surge-in-investment-shows-canada-loves-its-startups-and-so-do-u-s-investors>
- 7 Froman, Adam, "Will Canada's universities step up to stop the brain drain?" Globe and Mail, March 21, 2018, <https://www.theglobeandmail.com/report-on-business/rob-commentary/will-canadas-universities-step-up-to-stop-the-brain-drain/article38318121/>.
- 8 Interview with Anthony Lee, co-founder, C100, December 17, 2018.
- 9 Interview with Laura Buhler, executive director, C100, January 9, 2019.
- 10 Kawamoto, Dawn, "Investors pour \$300 million into these two San Francisco maker-designer startups," San Francisco Business Times, December 13, 2018, <https://www.bizjournals.com/sanfrancisco/news/2018/12/13/minted-faire-grab-300-million-in-total-funding.html>.
- 11 Rhodes, Max, "The Story of Faire," Medium, December 13, 2018, <https://medium.com/faire/the-story-of-faire-465d3d4c161f>.
- 12 Azevedo, Mary Ann, "Wholesale Marketplace Faire Secures \$100M At \$535M Valuation," Crunchbase News, December 14, 2018, <https://news.crunchbase.com/news/wholesale-marketplace-faire-secures-100m-at-535m-valuation/>.
- 13 Interview with Iain Klugman, CEO, Communitech, Fall 2018.
- 14 "Q&A: Why Ritual's Ray Reddy Left Silicon Valley," The Globe and Mail, November 3, 2018, <https://www.theglobeandmail.com/business/article-qa-why-rituals-ray-reddy-left-silicon-valley/>
- 15 "Ritual," Crunchbase, accessed March 2, 2019, <https://www.crunchbase.com/organization/ritual-3#section-funding-rounds>.
- 16 Schubarth, Cromwell, "Why a hot Canadian connected car startup's CEO and half its employees are based in Silicon Valley," Silicon Valley Business Journal, February 20, 2019, <https://www.bizjournals.com/sanjose/news/2019/02/20/mojio-connected-car-startup-vancouver-campbell-ca.html>.
- 17 "Toronto Rises to #4 in RE's Annual Tech Talent Scorecard," CBRE press release, June 25, 2018, <http://www.cbre.ca/EN/mediacentre/Pages/Toronto-Rises-to-4-in-CBRE%E2%80%99s-Annual-Tech-Talent-Scorecard.aspx>.
- 18 Clark, Kate, "Is Canada tech's next frontier? VCs think so," Pitchbook, June 19, 2018, <https://pitchbook.com/news/articles/is-canada-techs-next-frontier-vcs-think-so>.
- 19 Crunchbase.com, assessed March 2, 2019, <https://www.crunchbase.com/>.
- 20 Interview with Jen Thompson, Marketing Manager, Silicon Valley Bank, March 15, 2019.
- 21 Interview with Win Bear, Head of Business Development, Canada, Silicon Valley Bank, January 7, 2019.
- 22 Schuffham, Mark, "Canada's RBC eyes Silicon Valley talent at fintech hub," Reuters, June 8, 2016, <https://www.reuters.com/article/us-rbc-tech-idUSKCN0YU1SO>.
- 23 Galang, Jessica, "CIBC acquires Wellington Financial to support launch of CIBC innovation banking," Betakit, January 8, 2018, <https://betakit.com/cibc-acquires-wellington-financial-to-support-launch-of-cibc-innovation-banking/>.
- 24 Pofeldt, Elaine, "Trudeau's plan to lure Silicon Valley investors to Canada," CNBC, March 3, 2017, <https://www.cnbc.com/2017/03/02/trudeaus-plan-to-lure-silicon-valley-investors-to-canada.html>.
- 25 Ibid.
- 26 Kahn, Hamza, "Optionality and Adaptability: In Conversation with John Ruffolo (CEO of OMERS Ventures)," Student Life Network, July 12, 2018, <https://blog.studentlifenetwrok.com/2018/07/12/optionality-adaptability-in-conversation-w-john-ruffolo-ceo-omers-ventures/>.
- 27 "CalPERS Direct' Isn't Exactly Direct," Chief Investment Officer, November 19, 2018, <https://www.ai-cio.com/news/calpers-direct-isnt-exactly-direct/>.
- 28 "Exclusive: CalPers to Announce Direct Investment Program," Chief Investment Officer, May 17, 2018, <https://www.ai-cio.com/news/source-calpers-announce-direct-investment-program/>.
- 29 "CalPERS Direct' Isn't Exactly Direct," Chief Investment Officer, November 19, 2018, <https://www.ai-cio.com/news/calpers-direct-isnt-exactly-direct/>.

CHAPTER 4

Canadians in Silicon Valley: Human Capital and Commerce

- 1 Anderson, Stuart, "Immigrants and Billion-Dollar Companies," National Foundation for American Policy, October 2018, <https://nfap.com/wp-content/uploads/2018/10/2018-BILLION-DOLLAR-STARTUPS.NFAP-Policy-Brief.2018.pdf>.

- 30 "CalPERS Planned Private Equity Program Could Grow Quickly," Chief Investment Officer, December 24, 2018, <https://www.ai-cio.com/news/calpers-planned-private-equity-program-grow-quickly/>.
- 31 Whyte, Amy, "CalPERS teams up with Canadian pensions for infrastructure, ESG initiatives," Institutional Investor, June 6, 2018, <https://www.institutionalinvestor.com/article/b18jfpnv914ndx/calpers-teams-up-with-canadian-pensions-for-infrastructure,-esg-initiatives>.
- 32 Seiger, Alicia, "CalPERS Direct could point the way to more climate-wise investments," Axios, May 25, 2018, <https://www.axios.com/calpers-direct-could-point-the-way-to-more-climate-wise-investments-bbef8fc9-57e5-4d5b-ae87-03c86150888f.html>.
- 33 Jacobus, Arlene, "CalSTRS panel lays out options for pension fund to expand alts capabilities," Pensions & Investments, February 8, 2018, <https://www.pionline.com/article/20180208/ONLINE/180209836/calstrs-panel-lays-out-options-for-pension-fund-to-expand-alts-capabilities>.
- 34 Overbye, Dennis, "Extremely Large, Extremely Expensive: The Race for the Next Giant Telescopes," The New York Times, June 11, 2018, <https://www.nytimes.com/2018/06/11/science/thirty-meter-telescopes-costs.html>.
- 35 Stephens, Tim, "Next Generation Thirty Meter Telescope to begin construction in Hawaii," University of California News, July 28, 2014, <https://www.universityofcalifornia.edu/news/next-generation-thirty-meter-telescope-begin-construction-hawaii>.
- 36 "UC Davis Receives \$1 Million From Keck Foundation Following Virus Discovery," UC Davis College of Agricultural and Environmental Sciences, September 6, 2018, <https://caes.ucdavis.edu/news/uc-davis-receives-1-million-keck-foundation-following-virus-discovery>.
- CHAPTER 5**
- Canada's Evolving Tech Ecosystem**
- 1 Zhao, John, Doug Drew, and T. Scott Murray, "Brain Drain and Brain Gain: The Migration of Knowledge Workers from and to Canada," Education Quarterly Review, 2000, Vol. 6, No. 3, <https://www150.statcan.gc.ca/n1/en/pub/81-003-x/81-003-x1999003-eng.pdf?st=4UriZXqd>.
- 2 "The Global Innovation Index 2018: Energizing the World with Innovation," Cornell University, INSEAD, and WIPO (2018), <https://www.globalinnovationindex.org/analysis-indicator>.
- 3 "Canada's Innovation Strengths and Priorities," Canadian Trade Commissioner Service, Government of Canada, <http://www.tradecommissioner.gc.ca/innovators-innovateurs/strategies.aspx?lang=eng>.
- 4 "CIFAR Strategic Plan FY2018–FY2022," CIFAR, n.d., https://www.cifar.ca/docs/default-source/reports/cifar-stratpan.pdf?sfvrsn=42cc4259_4
- 5 "About Us," Canada Research Chairs, Government of Canada, September 10, 2018, http://www.chairs-chaires.gc.ca/about_us-a_notre_sujet/index-eng.aspx
- 6 "Evaluation of the Canada Excellence Research Chairs (CERC) Program," Canada Excellence Research Chairs, Government of Canada, July 3, 2015, http://www.cerc.gc.ca/about-au_sujet/publications/evaluation_2014-eng.aspx.
- 7 Asherman, Rena, "Canada Research Chairs Information Session, Canada Research Chairs, Government of Canada, 2011," https://www.bcit.ca/files/appliedresearch/pdf/2011_crc_info_session.pdf
- 8 "History," Perimeter Institute for Theoretical Physics, accessed March 4, 2019, <https://www.perimeterinstitute.ca/about/about/history>.
- 9 Interview with Michael Duschens, Managing Director, Perimeter Institute for Theoretical Physics, Fall 2018.
- 10 "FAQ," Perimeter Institute for Theoretical Physics, accessed March 4, 2019, https://www.perimeterinstitute.ca/about/about/faq#faq_how_many_researchers
- 11 "Corporate Plan 2018–19," Canada Foundation for Innovation, n.d., https://www.innovation.ca/sites/default/files/pdf/2018-19_cfi_corporate_plan_final.pdf
- 12 "National research facilities," Canada Foundation for Innovation, accessed March 12, 2019, <https://www.innovation.ca/national-research-facilities>.
- 13 Interview with Roseann O'Reilly Runte, President and CEO, Canada Foundation for Innovation, Fall 2018.
- 14 Morgan, Geoffrey, "What happened to Industry Canada? Trudeau elevates scientific research in new cabinet role," Financial Post, November 4, 2015, <https://business.financialpost.com/news/economy/what-happened-to-industry-canada-trudeau-elevates-scientific-research-in-new-cabinet-role>.
- 15 "Innovation, Science and Economic Development portfolio," Government of Canada, November 14, 2018, https://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_00022.html
- 16 "Innovation for a Better Canada: What You Told Us," Government of Canada, December 20, 2016, https://www.ic.gc.ca/eic/site/062.nsf/eng/h_00051.html.
- 17 Ibid.
- 18 "Canada's Innovation and Skills Plan," Government of Canada, March 22, 2017, <https://www.budget.gc.ca/2017/docs/themes/innovation-en.html>.
- 19 Ibid.
- 20 "Federal government spending \$500M to expand high-speed Internet to remote communities," CBC, December 15, 2016, <https://www.cbc.ca/news/politics/broadband-internet-access-rural-1.3898358>.
- 21 "Canada's Innovation and Skills Plan," Government of Canada, March 22, 2017, <https://www.budget.gc.ca/2017/docs/themes/innovation-en.html>.
- 22 "CIFAR Strategic Plan FY2018–FY2022," CIFAR, n.d., https://www.cifar.ca/docs/default-source/reports/cifar-stratpan.pdf?sfvrsn=42cc4259_4
- 23 "Proposed 2017 Federal Budget allocates little new spending for science for the coming year," Canadian Association of Physicists, March 23, 2017, <https://www.cap.ca/publications/cap-news/proposed-2017-federal-budget-allocates-little-new-spending-for-science-for-the-coming-year/>.
- 24 "Canada's new superclusters," Innovation, Science and Economic Development (ISED) Canada, Government of Canada, February 18, 2019, <https://www.ic.gc.ca/eic/site/093.nsf/eng/00008.html>.
- 25 "Next Generation Manufacturing Supercluster kicks into high gear," Innovation, Science and Economic Development (ISED) Canada, Government of Canada, November 13, 2018, <https://www.canada.ca/en/innovation-science-economic-development/news/2018/11/next-generation-manufacturing-supercluster-kicks-into-high-gear.html>.
- 26 "How Technology is Changing Toronto Employment," Tech Toronto, 2016, https://techtoronto.org/Report2016/images/TechTO_Report2016.pdf.
- 27 Khan, Salman, "Toronto Region—A Booming Tech Magnet for Canadian and Foreign Companies," Fintech Finance, December 5, 2017, <https://www.fintech.finance/01-news/toronto-region-a-booming-tech-magnet-for-canadian-foreign-companies/>.
- 28 "Salesforce to Invest \$2 Billion in Canada Over Next Five Years," BNN Bloomberg, February 8, 2018, <https://www.bnnbloomberg.ca/salesforce-to-invest-2-billion-in-canada-over-next-five-years-1.992222>
- 29 "Top 250 Canadian ICT Companies," 2016 and 2017, Branham Group Inc., assessed March 3, 2019, <https://www.branham300.com/index.php?year=2018&listing=1>.
- 30 Sali, David, "Ontario-IBM incubator partnership sets up in Bayview Yards," Ottawa Business Journal, September 29, 2017, <https://obj.ca/article/ontario-ibm-incubator-partnership-sets-bayview-yards>.
- 31 Etherington, Darrell, "GM launcher new dedicated tech center in Canada," TechCrunch, January 22, 2018, <https://techcrunch.com/2018/01/22/gm-launches-a-new-dedicated-tech-center-in-canada/>
- 32 "Uber Announces Significant Jobs Investment in Canada," Uber Canada news release, Cision, September 13, 2018, <https://www.newswire.ca/news-releases/uber-announces-significant-jobs-investment-in-canada-693155581.html>
- 33 "Congratulations to Uber on planned Toronto expansion," Vector Institute press release, September 13, 2018, <https://vectorinstitute.ai/2018/09/14/congratulations-to-uber-on-planned-toronto-expansion/>
- 34 "About Us," Ontario Centres of Excellence, accessed March 3, 2019, <http://oce-ontario.org/projects>.
- 35 "Historic ENCQOR partnership will launch Canada's 5G communication highway," Ontario Centres of Excellence, March 19, 2018, <https://www.oce-ontario.org/news-events/news/2018/03/19/historic-encqor-partnership-will-launch-canada-s-5g-communication-highway>.
- 36 "Projects," Ontario Centres of Excellence, March 31, 2018, <https://oce-ontario.org/projects>.
- 37 Bergquist, Kyle, Carsten Fink, and Julio Raffo, World Intellectual Property Organization (WIPO), "Special Section: Identifying and Ranking the World's Largest Science and Technology Clusters, The Global Innovation Index 2018, Cornell University, INSEAD, and WIPO (2018), https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018-chapter14.pdf.
- 38 "Take a video tour of MaRS Discovery District," MaRS Discovery District, October 24, 2018, <https://www.youtube.com/watch?v=X4uPHuxmXcM>.
- 39 "Who We Are," MaRS, accessed March 4, 2019, <https://www.marsdd.com/about/story/>.
- 40 "Toronto's Waterfront is new destination for MaRS innovation hub," MaRS Discovery District news release, Cision, September 25, 2018, <https://www.prnewswire.com/news-releases/torontos-waterfront-is-new-destination-for-mars-innovation-hub-300717718.html>.
- 41 "Our Results," MaRS, accessed March 5, 2019, <https://www.marsdd.com/about/results/>.
- 42 "Meet Our Supporters," MaRS, accessed March 5, 2019, <https://www.marsdd.com/about/supporters/>.
- 43 "Tenants," MaRS, accessed March 5, 2019, <https://www.marsdd.com/ventures-and-tenants/?type=tenant>.
- 44 Interview with Jayson Myers, CEO, Next Generation Manufacturing Canada, Fall 2018.

- 45 Hinkson, Kamila, "Health, retail sectors help drive Quebec's jobless rate to historic low," CBC, January 5, 2018, <https://www.cbc.ca/news/canada/montreal/quebec-unemployment-rate-low-1.4474487>.
- 46 "More room to grow for all provincial economies in 2019," RBC Provincial Outlook, December 12, 2018, <http://www.rbc.com/economics/economic-reports/pdf/provincial-forecasts/provfcst-dec2018.pdf>.
- 47 "Montreal posts best job growth in 2017 among top 20 largest urban center in Canada and the U.S.," Montreal International, June 14, 2018, <http://www.montrealinternational.com/en/blog/montreal-posts-best-job-growth-in-2017-among-top-20-largest-urban-centers-in-canada-and-the-u-s/>.
- 48 "Artificial intelligence," Montreal International, accessed March 5, 2019, <http://www.montrealinternational.com/en/foreign-investments/sectors/artificial-intelligence/>.
- 49 "Montreal's artificial intelligence hub," Investissement Quebec, accessed March 5, 2019, <http://www.investquebec.com/international/en/secteurs-activite-economique/technologies-information-communications/Montreal-s-Artificial-Intelligence-Hub.html>.
- 50 "Coveo, a Leader in Artificial Intelligence, Expands Montréal Office to 300 Employees to Support Growth," Coveo, November 12, 2018, <https://www.coveo.com/en/company/news-releases/2018/coveo-expands-montreal-office>.
- 51 "Facebook invests over \$7M U.S. in MILA and AI research in Montreal," UdeMNouvelles, September 15, 2017, <https://nouvelles.umontreal.ca/en/article/2017/09/15/facebook-invests-over-7m-u.s.-in-mila-and-ai-research-in-montreal/>.
- 52 Galang, Jessica, "Microsoft wants to double size of Maluba's Montreal office, donates \$6 million to Université de Montreal for AI research," BetaKit, January 18, 2017, <https://betakit.com/microsoft-wants-to-double-size-of-maluubas-montreal-office-donates-6-million-to-universite-de-montreal-for-ai-research/>.
- 53 De Vyncq, Gerrit, "Element AI Raises \$102 Million to Take on Amazon, Alphabet," Bloomberg, June 14, 2017, <https://www.bloomberg.com/news/articles/2017-06-14/element-ai-raises-102-million-to-take-on-amazon-alphabet>.
- 54 "Information and Communications Technologies," Montreal International, accessed March 5, 2019, <http://www.montrealinternational.com/en/foreign-investments/sectors/information-and-communications-technologies/ict-hub-map/>.
- 55 "Multimedia: The video game explosion," Investissement Quebec, accessed March 5, 2019, <https://www.investquebec.com/international/en/industries/multimedia/the-video-game-explosion.html>.
- 56 "Greater Montreal: A Hotspot for Data Hosting and Shared Services," Montreal International, November 2017, <http://www.montrealinternational.com/en/wp-content/uploads/sites/2/2017/11/BUSINESS-CASE-DATACENTRE-EN-NOV-2017.pdf>.
- 57 Zubairi, Amira, "Often overlooked, Quebec City's tech is 'punching above its weight'," Betakit, September 6, 2018, <https://betakit.com/often-overlooked-quebec-citys-tech-is-punching-above-its-weight/>.
- 58 "Profile of the British Columbia Technology Sector: 2017 Edition, BC Stats, November 2017," <https://www2.gov.bc.ca/gov/content/data/statistics/business-industry-trade/industry/high-technology>.
- 59 "Information and Communication Technologies and Wireless," Trade and Invest British Columbia, accessed March 5, 2019, <https://www.britishcolumbia.ca/invest/industry-sectors/technology/information-and-communication-technologies-and-wir/>.
- 60 "Profile of the British Columbia Technology Sector: 2017 Edition, BC Stats, November 2017," <https://www2.gov.bc.ca/gov/content/data/statistics/business-industry-trade/industry/high-technology>.
- 61 "British Columbia technology report card: Scaling up BC's tech ecosystem," KPMG, October 2016. <https://assets.kpmg.com/content/dam/kpmg/ca/pdf/2016/10/BC-tech-report-card-FY16.pdf>.
- 62 "Essential Facts About the Canadian Video Game Industry," Entertainment Software Association of Canada, 2017, http://theesa.ca/wp-content/uploads/2017/10/ESAC2017_Booklet_13_Digital.pdf.
- 63 "Western Canada's Clean Tech Ecosystem Gains Greater Access to Global Markets," Western Economic Diversification Canada press release, January 22, 2018, <https://www.newswire.ca/news-releases/western-canadas-clean-tech-ecosystem-gains-greater-access-to-global-markets-670584283.html>.
- 64 "Information and Communication Technologies and Wireless," Trade and Invest British Columbia, accessed March 5, 2019, <https://www.britishcolumbia.ca/invest/industry-sectors/technology/information-and-communication-technologies-and-wir/>.
- 65 "Government of Canada's new innovation program expected to create tens of thousands of middle-class jobs," Government of Canada news release, February 15, 2018, <https://www.canada.ca/en/innovation-science-economic-development/news/2018/02/government-of-canadas-new-innovation-program-expected-to-create-tens-of-thousands-of-middle-class-jobs.html>.
- 66 "Digital Technology Supercluster from Innovation, Science and Economic Development Canada," Government of Canada, February 15, 2018, <https://www.ic.gc.ca/eic/site/093.nsf/eng/00011.html>.
- 67 "Canada's Digital Technology Supercluster Business Plan" Canada-wide, Global Impact," Canada's Digital Technology Supercluster, 2017, <https://www.digitalsupercluster.ca/wp-content/uploads/2018/02/Canadas-Digital-Technology-Supercluster-Business-Plan.pdf>.
- 68 Interview with Iain Evans, Technology Lead, Digital Technology Supercluster, March 2019.
- 69 "NASA Quantum Artificial Intelligence Laboratory (QuAIL)," NASA, accessed March 20, 2019, <https://ti.arc.nasa.gov/tech/dash/groups/physics/quail/>.
- 70 "Customers," D-Wave Systems, accessed March 20, 2019, <https://www.dwavesys.com/our-company/customers>.
- 71 Interview with Warren Wall, Executive Vice President, Corporate Affairs, D-Wave Systems, March 2019.
- 72 Cassels, Jamie et al., "Opinion: Key to B.C.'s success is talent," Vancouver Sun, February 1, 2018, <https://vancouver.sun.com/opinion/op-ed/opinion-key-to-b-c-s-success-is-talent>.
- 73 "Innovate BC awards nearly \$1M to accelerate commercialization of innovative research projects," Innovate BC press release, October 11, 2018. <https://innovatebc.ca/news/fifth-ignite-awards-winners/>.
- 74 "New Ventures BC Impact Study Reveals Major Economic Results," New Ventures BC, November 22, 2017, <http://www.newventuresbc.com/2017/11/new-ventures-bc-impact-study-reveals-major-economic-results-for-tech-sector/>.
- 75 Orton, Tyler, "Volta Air takes \$110k top prize at innovate BC-New Ventures competition," Business in Vancouver, September 25, 2018, <https://biv.com/article/2018/09/volta-air-takes-110k-top-prize-innovate-bc-new-ventures-competition>.
- 76 "Canada Venture Capital 2018," CBInsights, accessed March 12, 2018, <https://www.cbinsights.com/research/report/canada-venture-capital-q4-2018/>.
- 77 "Canada Startup Outlook 2019," Silicon Valley Bank, February 2019, https://www.svb.com/globalassets/library/uploadedfiles/content/trends_and_insights/reports/startup_outlook_report/canada/svb-suo-canada-report-2019.pdf.
- 78 Field, Hayden, "The International Entrepreneur Rule Wasn't Perfect, but the Trump Administration Killing It Sends the Wrong Message, Experts Say," Entrepreneur, May 31, 2018, <https://www.entrepreneur.com/article/314258>.
- 79 Dingman, Shane, "Ottawa seeks to attract foreign talent by making Startup Visa Program permanent," The Globe and Mail, July 30, 2017, <https://www.theglobeandmail.com/report-on-business/small-business/startups/federal-government-to-root-start-up-visa-program-in-policy/article35833809/>.
- 80 "Digital Talent: Road to 2020 and Beyond," Information and Communications Technology Council (ICTC), March 2016, https://www.ictc-ctic.ca/wp-content/uploads/2016/03/ICTC_DigitalTalent2020_ENGLISH_FINAL_March2016.pdf.
- 81 Spicer, Zachary, Nathan Olmstead, and Nicole Goodman, "Reversing the Brain Drain: Where is Canadian STEM Talent Going?" Brock University and University of Toronto, May 2018, <https://brocku.ca/social-sciences/political-science/wp-content/uploads/sites/153/Reversing-the-Brain-Drain.pdf>.
- 82 Graham, Jack, "The open secret to Canada's tech boom," CapX, June 15, 2018, <https://capx.co/the-open-secret-to-canadas-tech-boom/>.
- 83 CB Insights, Knowledge is Power, March 5, 2019.
- 84 "Survey: Toronto-region tech companies saw increase in international hiring in 2017," MaRS Discovery District, March 29, 2018, <https://www.marsdd.com/media-centre/survey-toronto-region-tech-companies-saw-increase-in-international-hiring-in-2017/>.
- 85 Gonzalez-Barrera, Ana and Philip Connor, "Around the World, More Say Immigrants Are a Strength Than a Burden," Pew Research center, March 14, 2019, http://www.pewglobal.org/wp-content/uploads/sites/2/2019/03/Pew-Research-Center_Global-attitudes-towards-immigrants_report_2019-03-14.pdf.

IMAGE CREDITS

- Page 1: Maple leaf photo by Ninadoiron on Pixabay
- Page 3: Ottawa photo by DEZALB on Pixabay
- Page 14: Vancouver photo by Rye Jesson on Unsplash
- Page 15: Vancouver photo by Kyle Ryan on Unsplash
- Page 25: Currency photo by Michelle Spollen on Unsplash
- Page 33: Toronto photo by Conor Samuel on Unsplash
- Page 43: Montreal photo by Marc-Olivier Jodoin on Unsplash
- Page 50: Quayside image by Sidewalk Toronto
- Page 59: Maple leaf photo by GoranH on Pixabay

Project Sponsors

Canada



AIR CANADA



Silicon Valley Bank

ABOUT THE BAY AREA COUNCIL ECONOMIC INSTITUTE

Since 1990, the Bay Area Council Economic Institute has been the leading think tank focused on the economic and policy issues facing the San Francisco/Silicon Valley Bay Area, one of the most dynamic regions in the United States and the world's leading center for technology and innovation. A valued forum for stakeholder engagement and a respected source of information and fact-based analysis, the Institute is a trusted partner and adviser to both business leaders and government officials. Through its economic and policy research and its many partnerships, the Institute addresses major factors impacting the competitiveness, economic development and quality of life of the region

and the state, including infrastructure, globalization, science and technology, and health policy. It is guided by a Board of Advisors drawn from influential leaders in the corporate, academic, non-profit, and government sectors. The Institute is housed at and supported by the Bay Area Council, a public policy organization that includes hundreds of the region's largest employers and is committed to keeping the Bay Area the world's most competitive economy and best place to live. The Institute also supports and manages the Bay Area Science and Innovation Consortium (BASIC), a partnership of Northern California's leading scientific research laboratories and thinkers.



Bay Area Council Economic Institute

353 Sacramento Street, Suite 1000, San Francisco, CA 94111

www.bayareaeconomy.org • bacei@bayareacouncil.org