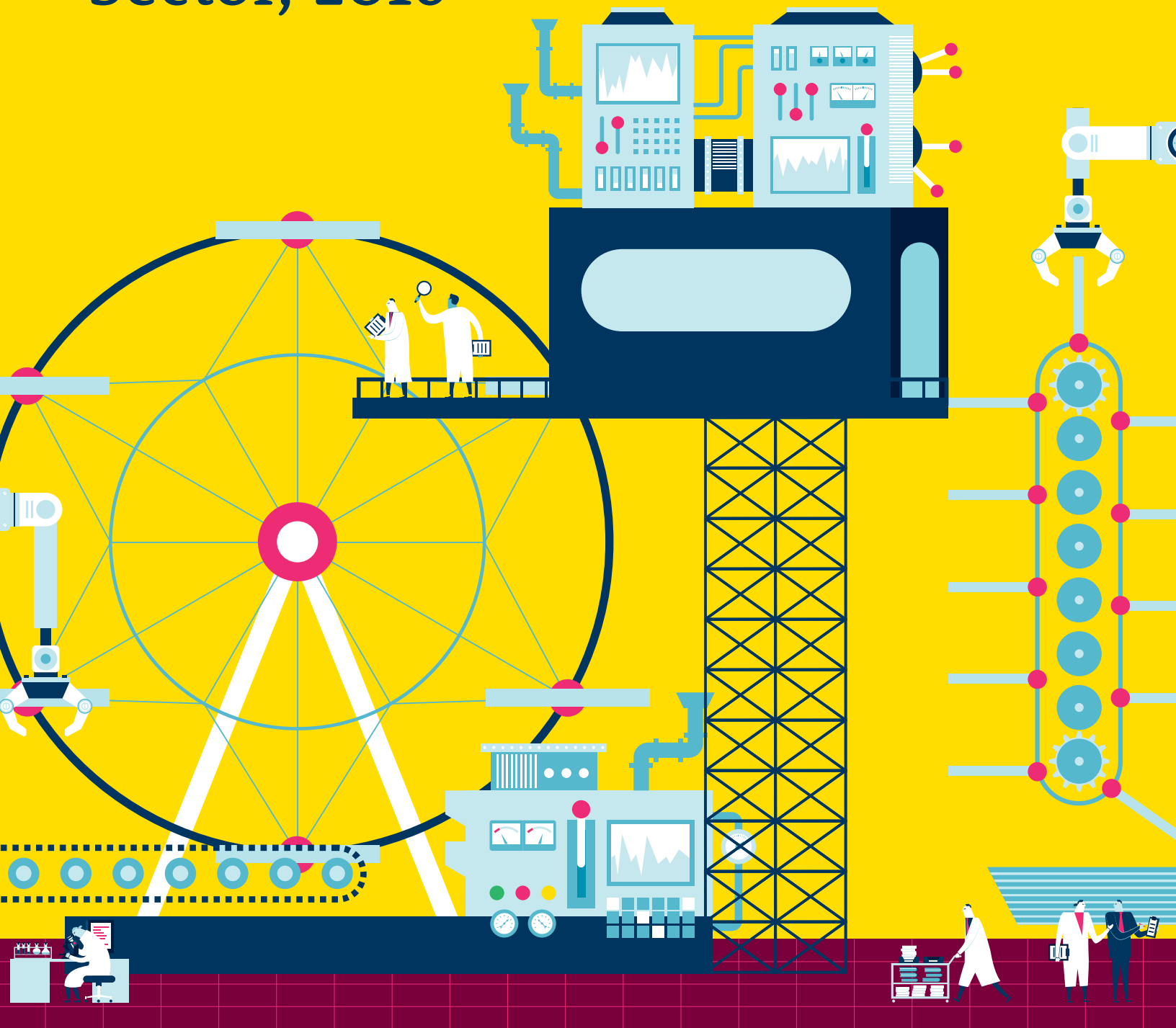


The State of Canada's Tech Sector, 2016

July 2016



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OUR PARTNERS



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FOREWORD

Canada is home to a vibrant and diverse tech sector that is a major driver of innovation and economic growth.



Canada is home to a vibrant and diverse tech sector that is a major driver of innovation and economic growth. However, to date, we have only had a limited view of how pervasive of an impact technology – and technology-related jobs – has on the size of our economy and its contribution to our workforce.

The way we traditionally think about the tech sector – as one industry sector among many – understates the fact that many of the tools, techniques, and skills that we associate with “high tech” are in fact utilized across a much broader section of the economy. Looking through this lens, Canada’s tech sector is much bigger than our current definitions are able to capture.

The Brookfield Institute for Innovation + Entrepreneurship has developed the first pan-Canadian definition of Canada’s tech sector that attempts to more accurately capture the sector’s contribution to Canada’s economy. To do this, we

developed our definition from the ground up by adopting and applying methodologies first used by the UK’s Nesta, the Brookings Institution and the United States Bureau of Labor Statistics.

We are thrilled to work with an accomplished group of partners who reflect the diversity and strength of Canada’s tech sector and have contributed to the success of this report. We would like to sincerely thank them for their input and support.

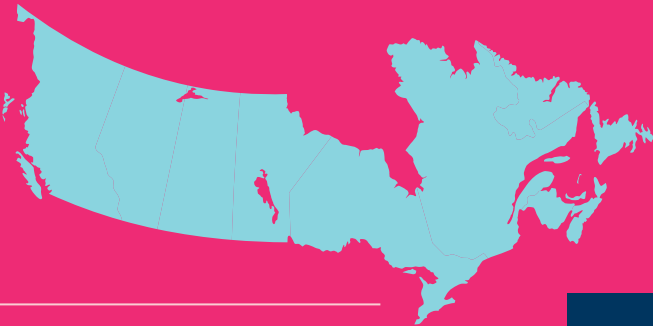
Thank you very much for taking the time to read *The State of Canada’s Tech Sector, 2016*. We hope it provides an interesting and useful new addition to understanding the importance of how the tech sector is contributing to Canada’s shared prosperity.

Sean Mullin, Executive Director
Brookfield Institute for Innovation + Entrepreneurship

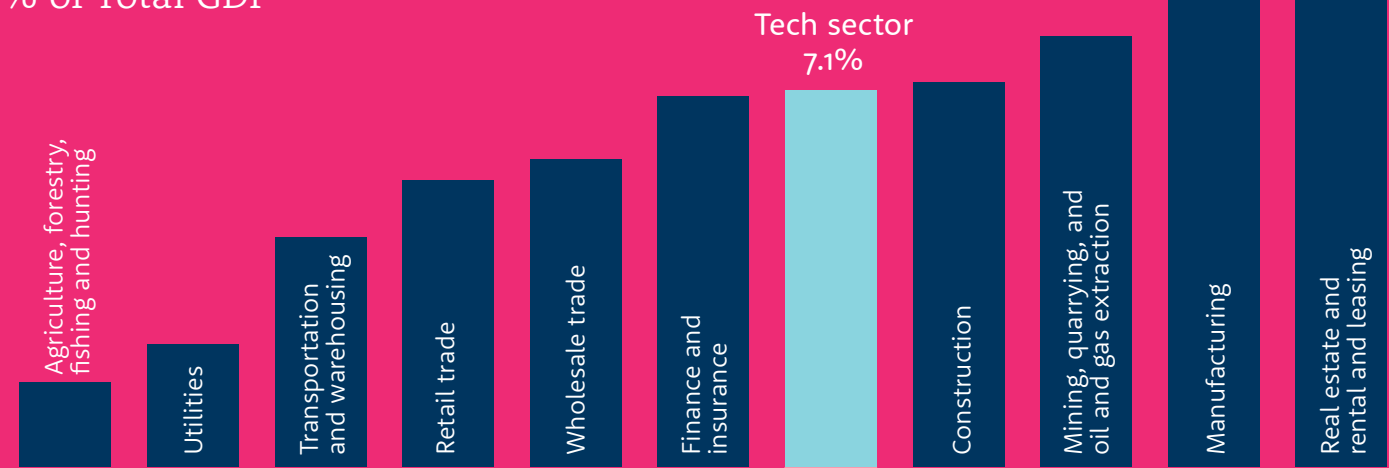
EXECUTIVE SUMMARY

\$117b

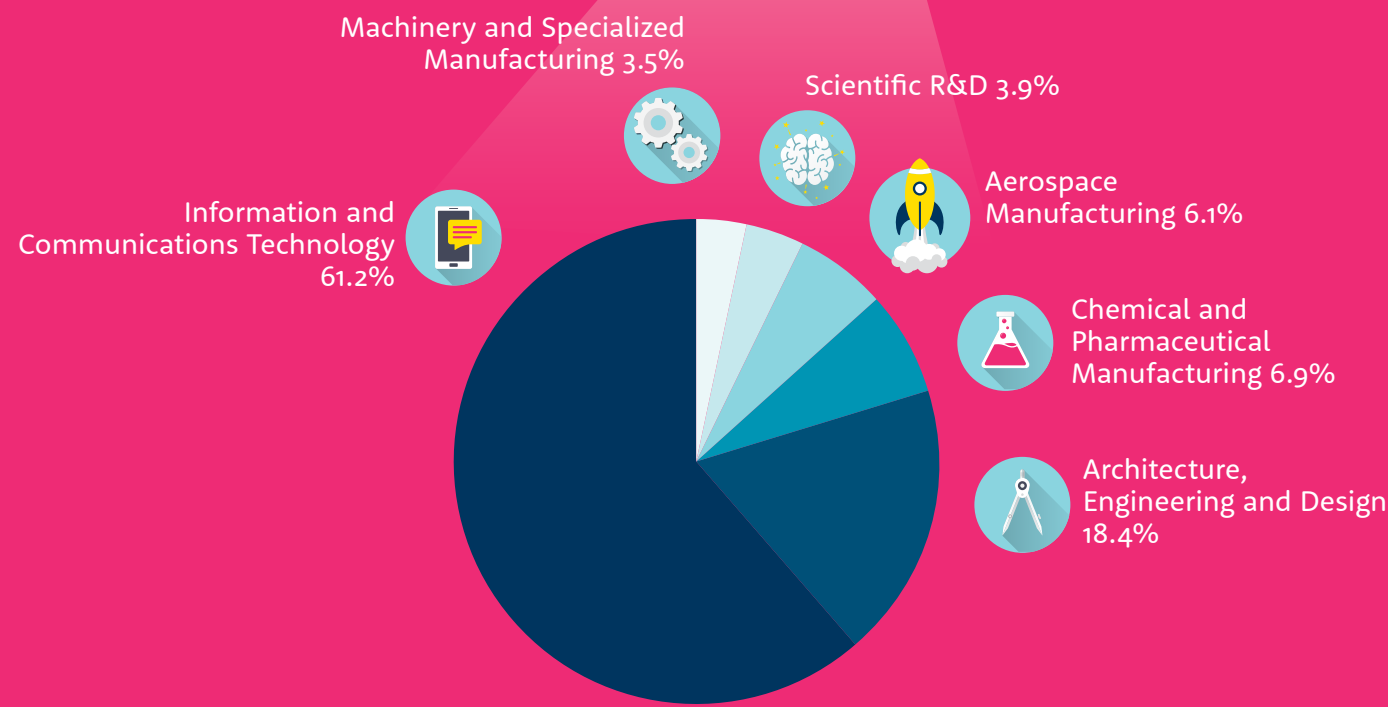
Tech
Sector
GDP



% of Total GDP

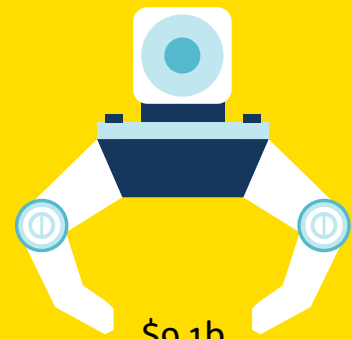


Tech Sector GDP by Industry Group

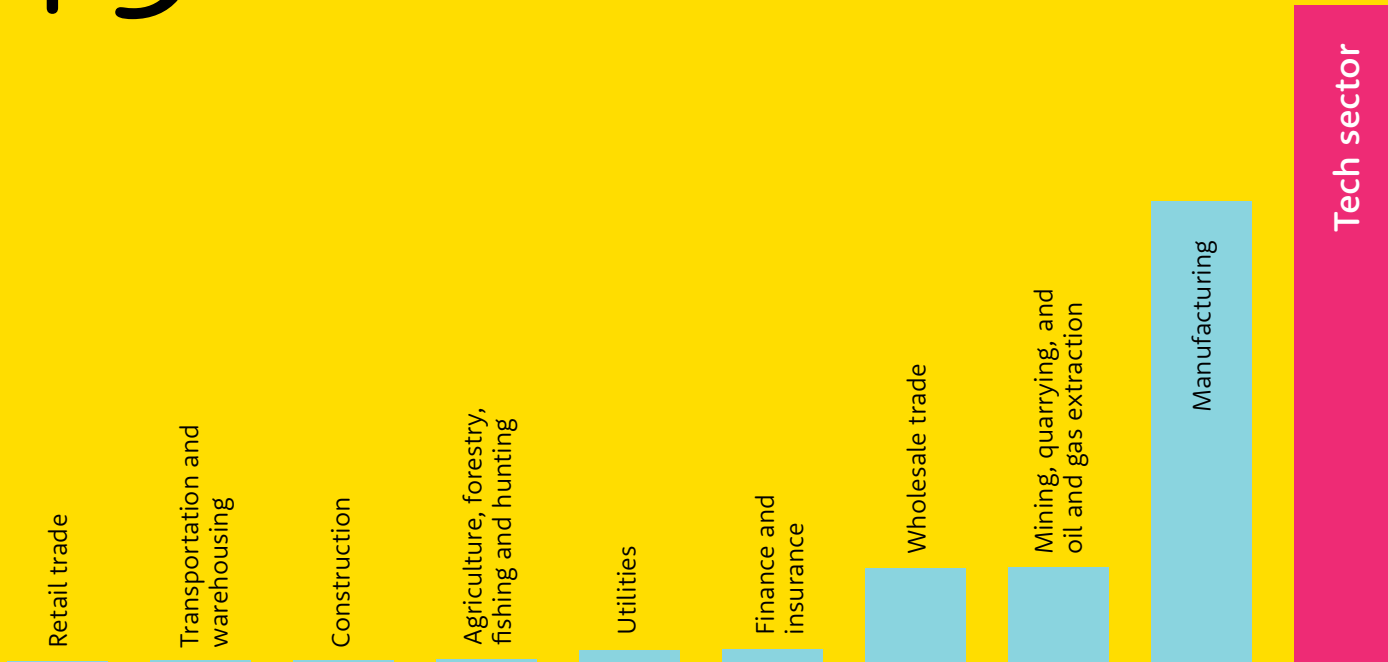


Business Enterprise Research & Development

\$9.1b



\$9.1b



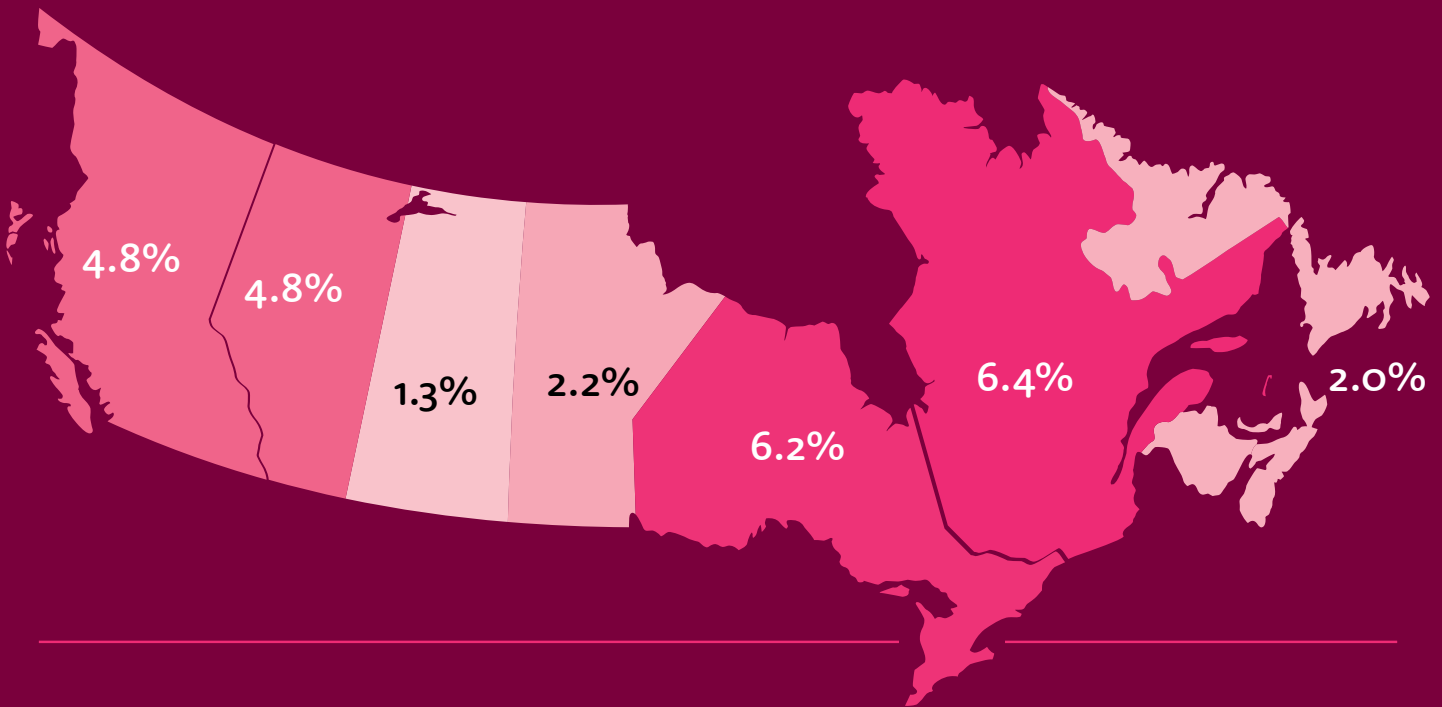
71,000 tech sector firms across Canada



864,000

tech sector employees across Canada

Tech Sector as a Proportion of Provincial Employment

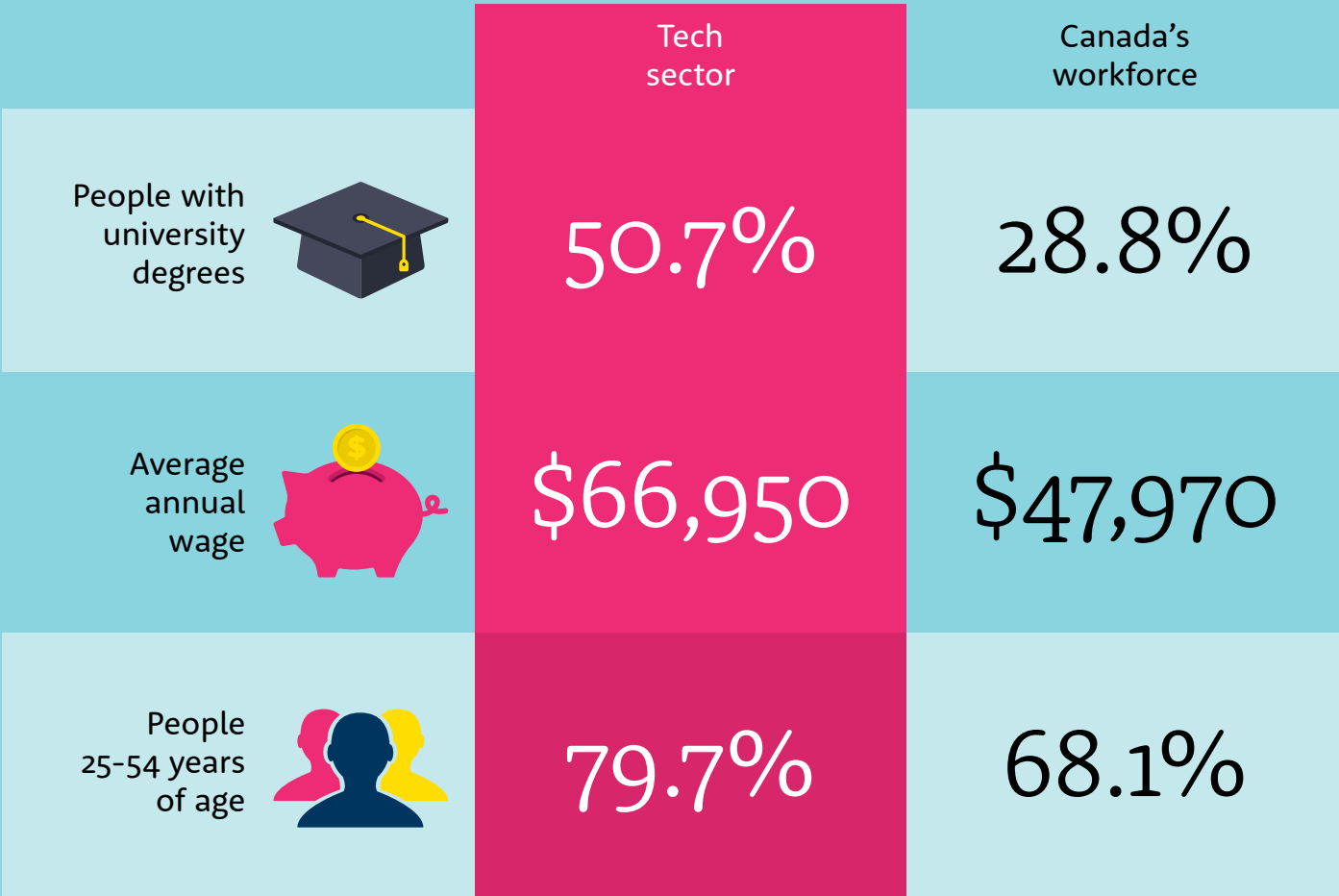


5.6%

of Canada's total employment
is in the tech sector

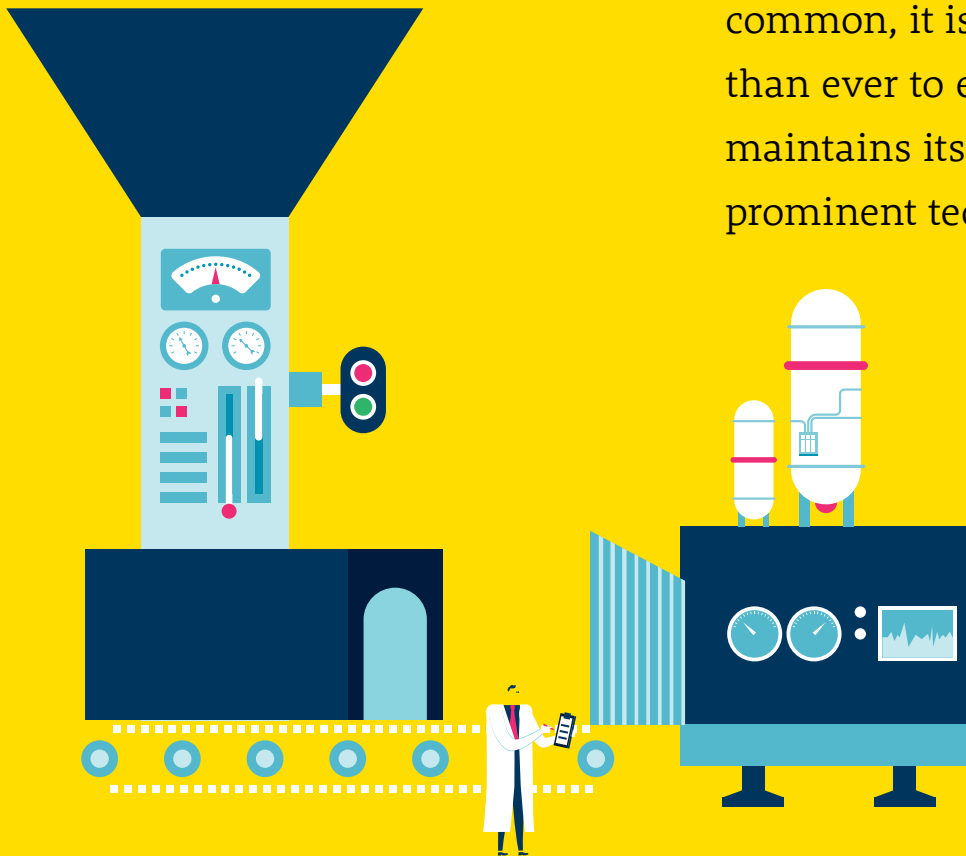


Tech Professionals



INTRODUCTION

As the tech sector continues to grow and emerging technologies from around the world become more common, it is now more important than ever to ensure Canada maintains its position as a growing, prominent tech economy.



Increasingly, persistently low energy and commodity prices have redirected the spotlight towards the tech sector to drive economic growth in Canada. This dynamic sector is a cornerstone of Canada's growing knowledge economy. It is driven by an entrepreneurial spirit and reliance on continuous innovation for growth and resilience.

The effect of the tech sector is felt throughout Canada. New technologies drive employment and economic growth, transform traditional industries, and reinvent how we work and go about our daily lives. As the tech sector continues to grow and emerging technologies from around the world become more common, it is now more important than ever to ensure Canada maintains its growing, prominent tech economy.

However, past efforts to define the tech sector, while useful, have almost exclusively focused on

the information and communications technology sector. Today, technology has become so ubiquitous across all Canadian industries that this approach understates the true impact that the tech sector has on Canada's economy.

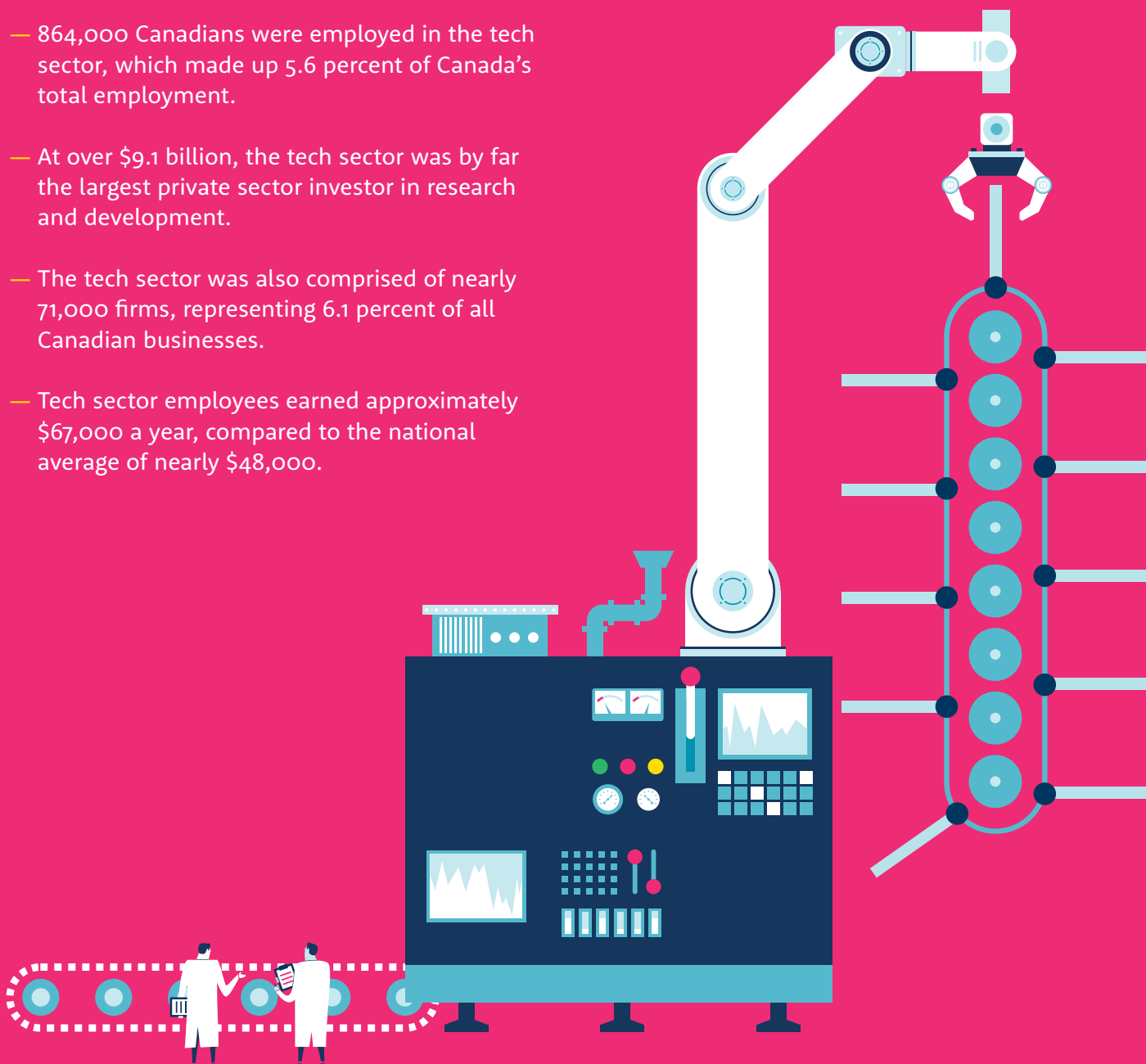
For this report, we developed the first pan-Canadian definition of Canada's tech sector using a proven methodology that has defined other sectors internationally. It is our goal to identify the composition and accurately measure the impact that Canada's tech sector has on the economy.

Using our more encompassing definition, we found that Canada's tech sector is exceptionally diverse, ranging from digital technologies to aerospace and pharmaceuticals. The sector is also much broader in size, scope and geography than ever before. It is truly a pan-Canadian sector with pan-Canadian impacts.

KEY FINDINGS

This report shows that the tech sector is a critical component of Canada's economy. In 2015:

- The tech sector was directly responsible for \$117 billion or 7.1 percent of Canada's economic output, greater than that of the finance and insurance industry.
- 864,000 Canadians were employed in the tech sector, which made up 5.6 percent of Canada's total employment.
- At over \$9.1 billion, the tech sector was by far the largest private sector investor in research and development.
- The tech sector was also comprised of nearly 71,000 firms, representing 6.1 percent of all Canadian businesses.
- Tech sector employees earned approximately \$67,000 a year, compared to the national average of nearly \$48,000.



DEFINING THE TECH SECTOR

Drawing from methodologies employed by Nesta and the United States Bureau of Labor Statistics, we conducted a dynamic mapping exercise to develop a custom definition of the tech sector in Canada.



The tech sector has been traditionally defined as companies operating in the information and communications technology (ICT) sector. However, technology use and production is now ubiquitous across all industries. The result is a much more encompassing tech sector, made up of a diverse collection of industries. Therefore, it was important to develop a new definition that more precisely estimates the impact that Canada's tech sector has on the economy.

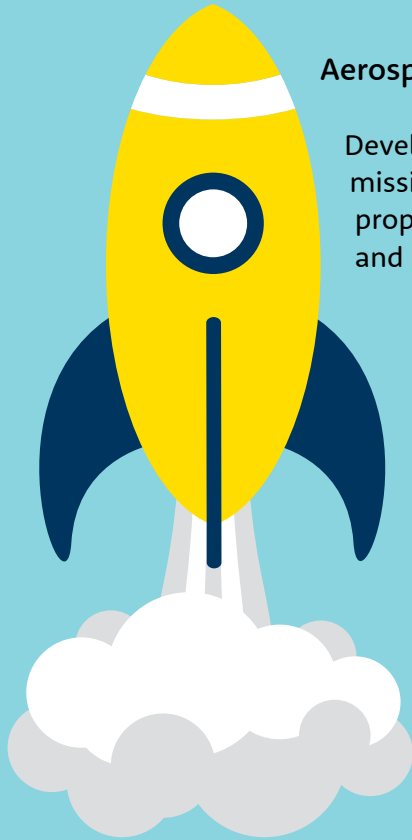
Drawing from methodologies employed by Nesta¹ and the United States Bureau of Labor Statistics² we conducted a dynamic mapping exercise to develop a custom definition of the tech sector in Canada. This exercise unfolded in three stages. First, we identified “tech occupations” using Employment and Social Development Canada’s (ESDC) occupation descriptions. Next, we cross-referenced the proportion of tech occupations against each industry. Finally, those industries that had a proportion of tech employment that met

or exceeded our threshold of 15 percent, which is more than 3 times the national average, were considered members of the tech sector. We invite you to read the Appendix for a more detailed description of our methodology.

Our definition of the tech sector includes all of the industries in Statistics Canada's custom aggregation of the ICT sector, plus a number of other industries that play a critical role in Canada's tech sector, including aerospace manufacturing, scientific research and development (R&D) and chemical and pharmaceutical and manufacturing.

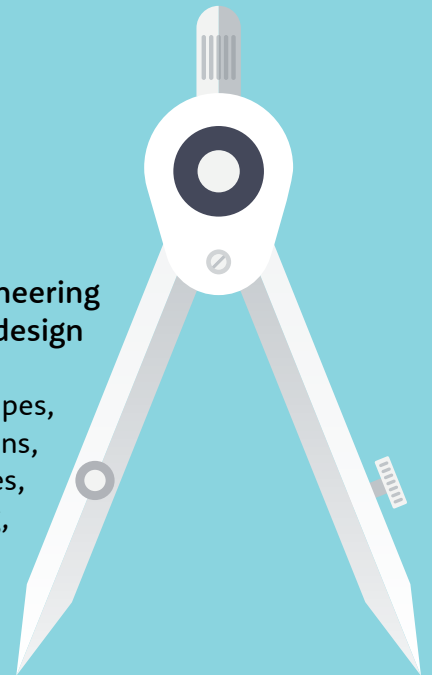
Overall, our custom definition includes 22 industries: 10 in manufacturing, 1 in wholesale trade, 6 in the information and cultural industries, 4 in professional, scientific and technical services, and 1 in other services (except public administration). For this report, we applied this definition of the tech sector as often as possible, but due to data limitations, ICT is occasionally used as a proxy.

CANADA'S TECH SECTOR



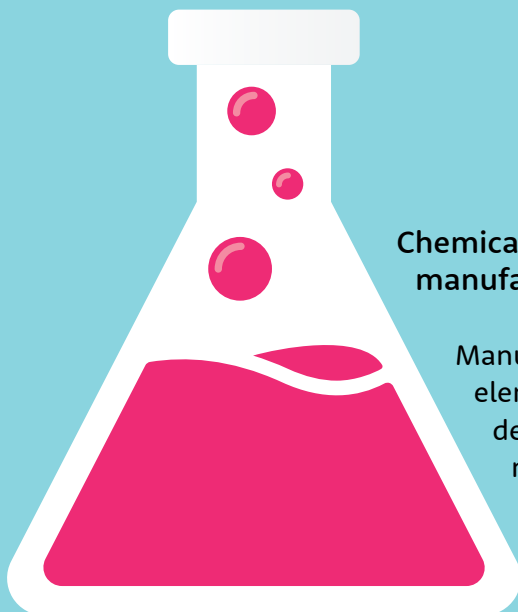
Aerospace manufacturing

Developing and manufacturing aircraft, missiles, space vehicles and their engines, propulsion units, auxiliary equipment, and parts thereof.



Architecture, engineering and design

Designing structures, landscapes, interiors, industrial applications, graphics, and specialized services, as well as drafting, surveying, mapping, and conducting building inspections and laboratory and on-site testing.



Chemical and pharmaceutical manufacturing

Manufacturing separate chemical elements or separate chemically-defined compounds, and drugs, medicines and related products for human or animal use.

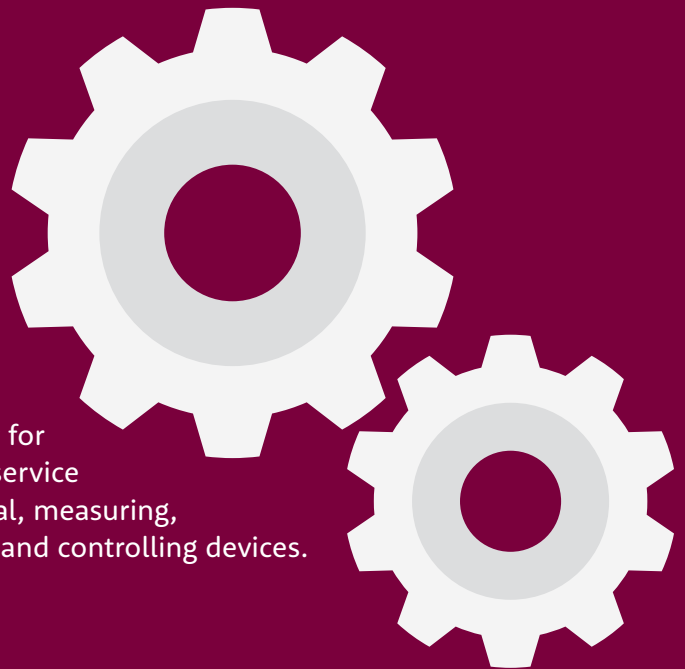


Information and communications technology (ICT)

Producing goods or services, or supplying technologies used to process, transmit or receive information.

Machinery and specialized manufacturing

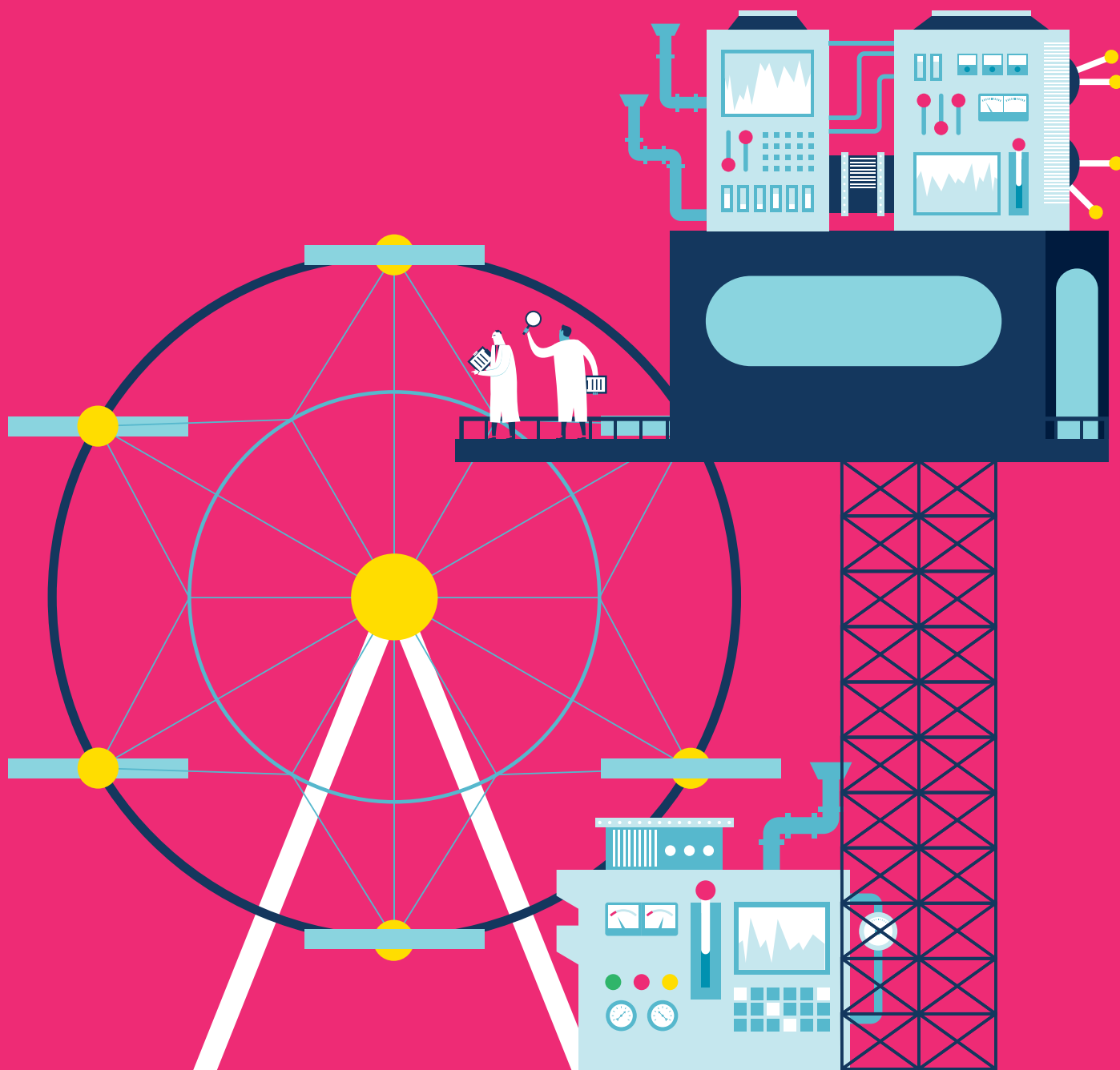
Manufacturing machinery for use in commercial and service industries, navigational, measuring, medical and controlling devices.



Scientific R&D

Conducting original investigation, undertaken on a systematic basis to gain new knowledge, and in the application of research findings or other scientific knowledge for the creation of new or significantly improved products or processes.

ECONOMIC IMPACT



The tech sector is a significant economic driver in Canada, exceeding the country's finance and insurance industry in terms of GDP and employment. These massive inputs to Canada's economic

performance come from not only ICT, but also from other prominent tech industries such as aerospace manufacturing, architecture, engineering and design, as well as chemical and pharmaceutical manufacturing.

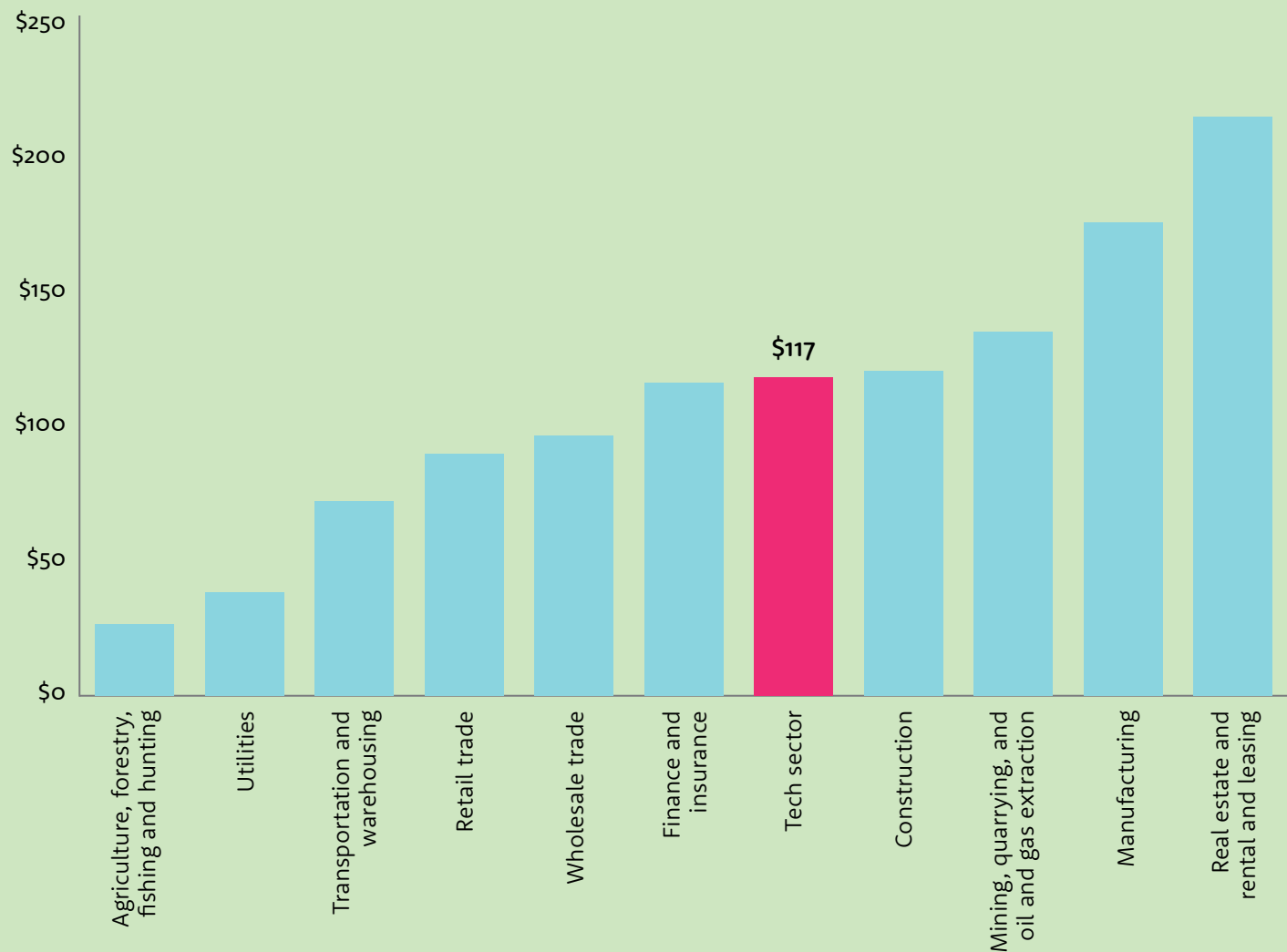
GDP

The tech sector was directly responsible for \$117 billion or 7.1 percent of Canada’s real economic output in 2015. The sector closest in output was Canada’s finance and insurance industry. While the GDP contribution of the tech sector is exceeded by

construction, mining, quarrying, and oil and gas extraction, manufacturing and real estate, the tech sector produced more than four times the GDP of the agriculture industry.

Figure 1:

GDP by Sector, 2015 (\$1B)



Statistics Canada CANSIM Table 379-0031, BII+E Analysis
Note: Navigational, measuring, medical and control instruments manufacturing (NAICS code 3345) was estimated using employment proportions

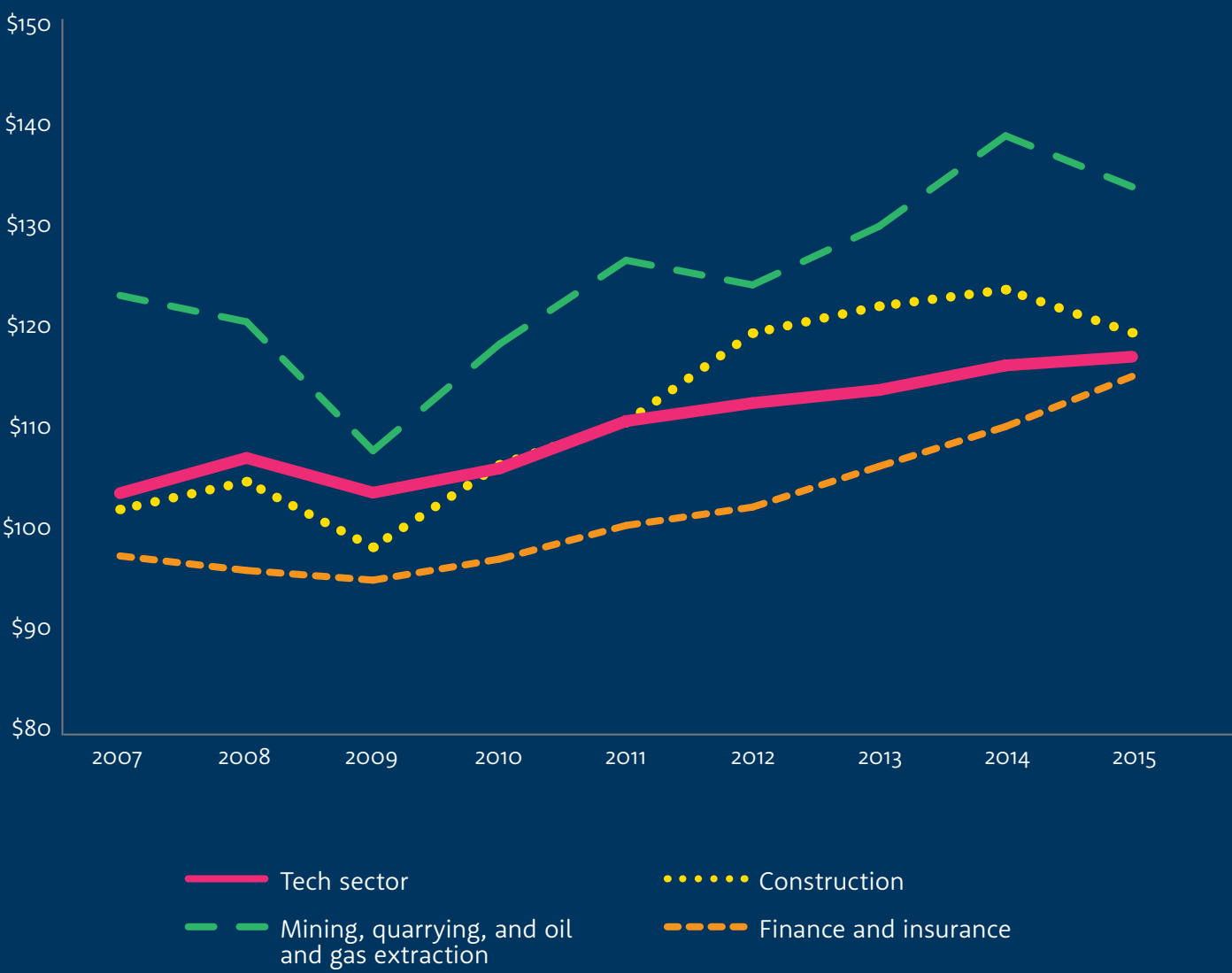
Throughout the report the tech sector is compared against many of Canada’s industries. However, industries that are largely under the broader public sector domain, such as educational services,

healthcare and social assistance are not included to more accurately compare the tech sector’s performance against other private sector industries.

Figures 2 and 3 compare the tech sector’s growth to three other industries that are a similar size and also represent a broad sampling of Canada’s economy. Since 2007, the tech sector’s value grew slowly and steadily. Throughout this period tech sector GDP was larger than the finance and

insurance industry, but grew at a slower pace since 2012. Interestingly, the tech sector appears to be less volatile than the construction and extractive industries, and was nearly equal in GDP to the construction industry in 2010 and 2011.

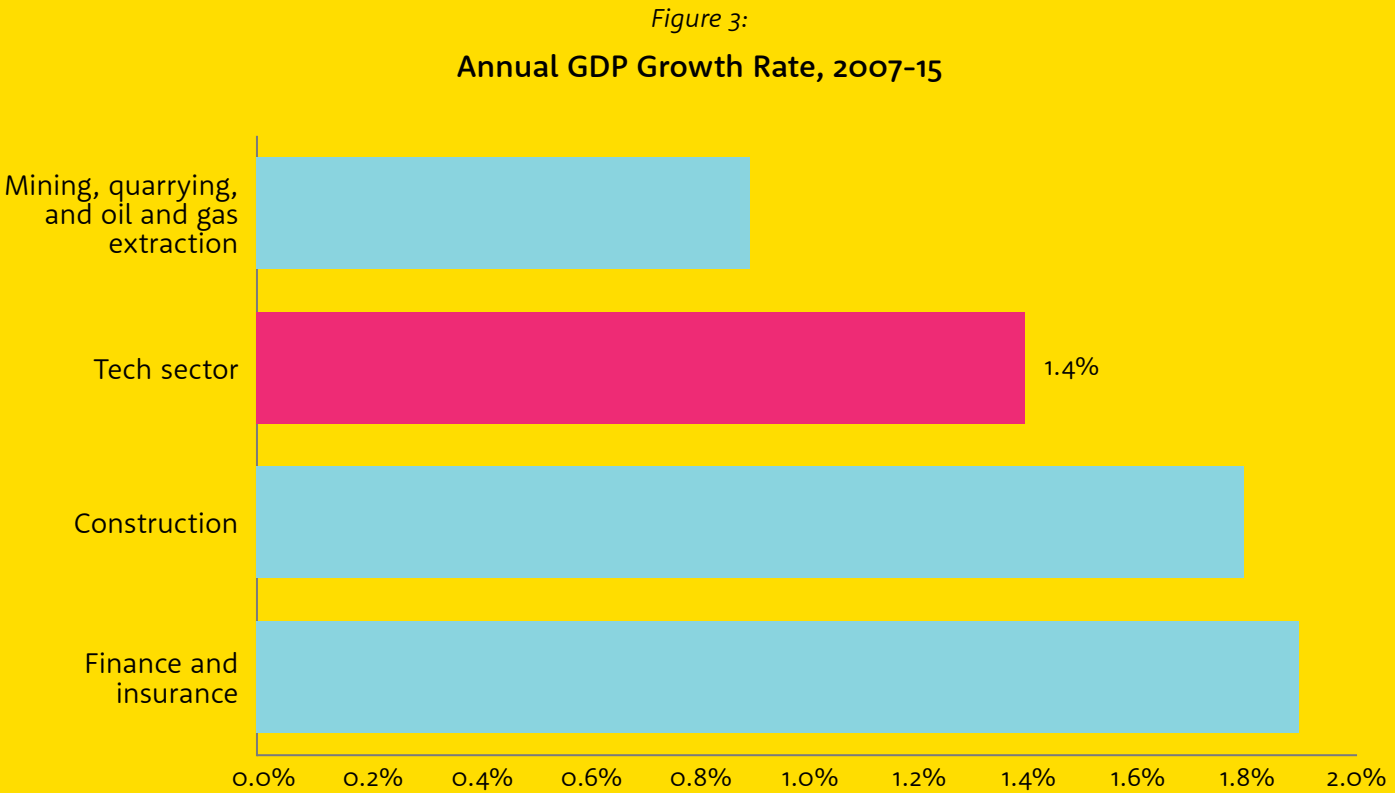
Figure 2:
GDP, 2007 15 (\$1B)



Statistics Canada CANSIM Table 379 0031, BII+E Analysis
Note: GDP is measured in chained (2007) dollars and is seasonally adjusted at annual rates

The tech sector’s annual GDP growth rate from 2007 to 2015 was 1.4 percent. This was lower than both finance and insurance at 1.9 percent and construction at 1.8 percent. However, the

tech sector performed considerably better than the mining, quarrying, and oil and gas extraction industry’s 0.9 percent GDP growth rate.

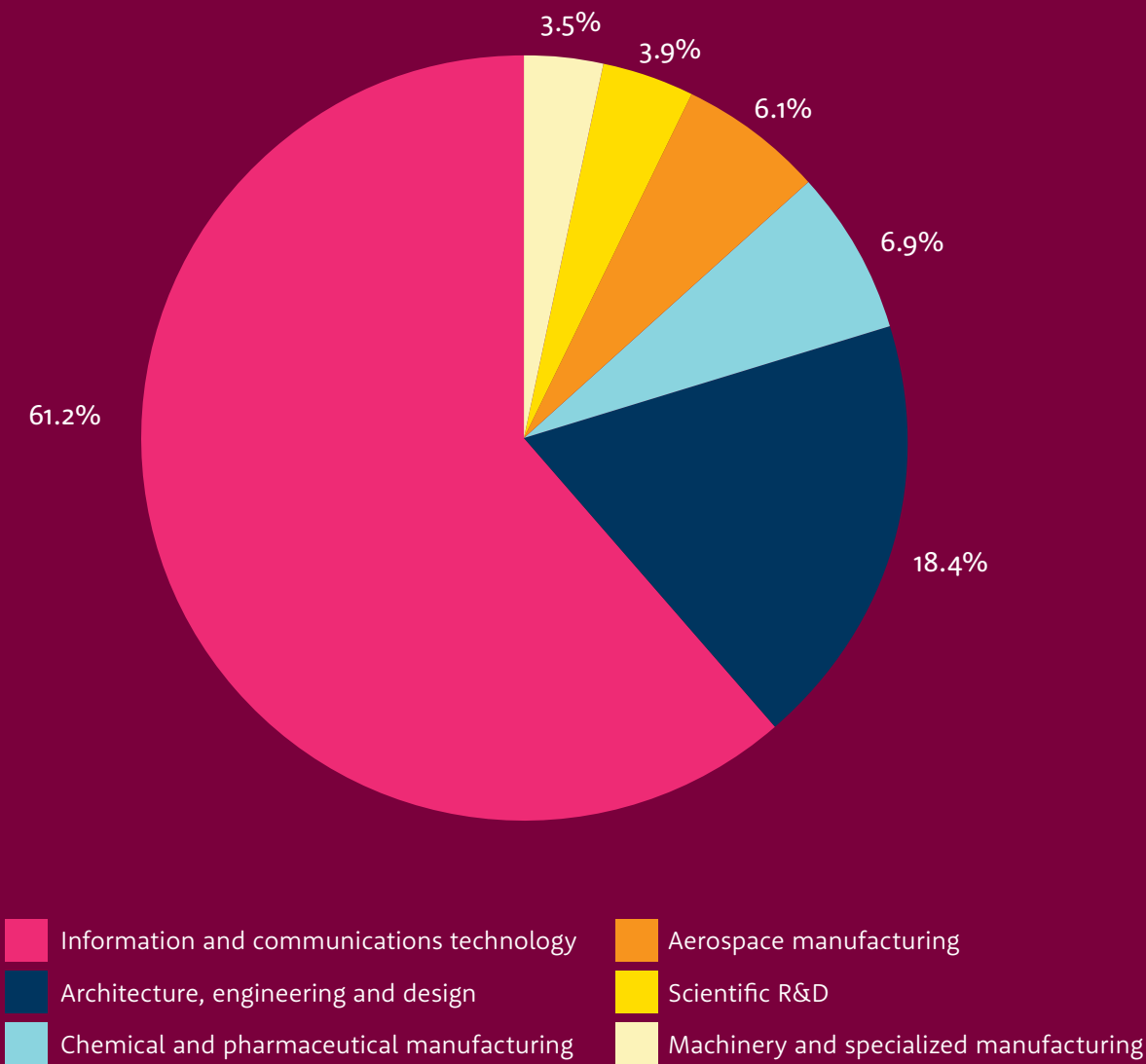


Statistics Canada CANSIM Table 379-0031, BII+E Analysis

The bulk of the tech sector’s output came from ICT, which includes some manufacturing, telecommunications as well as professional,

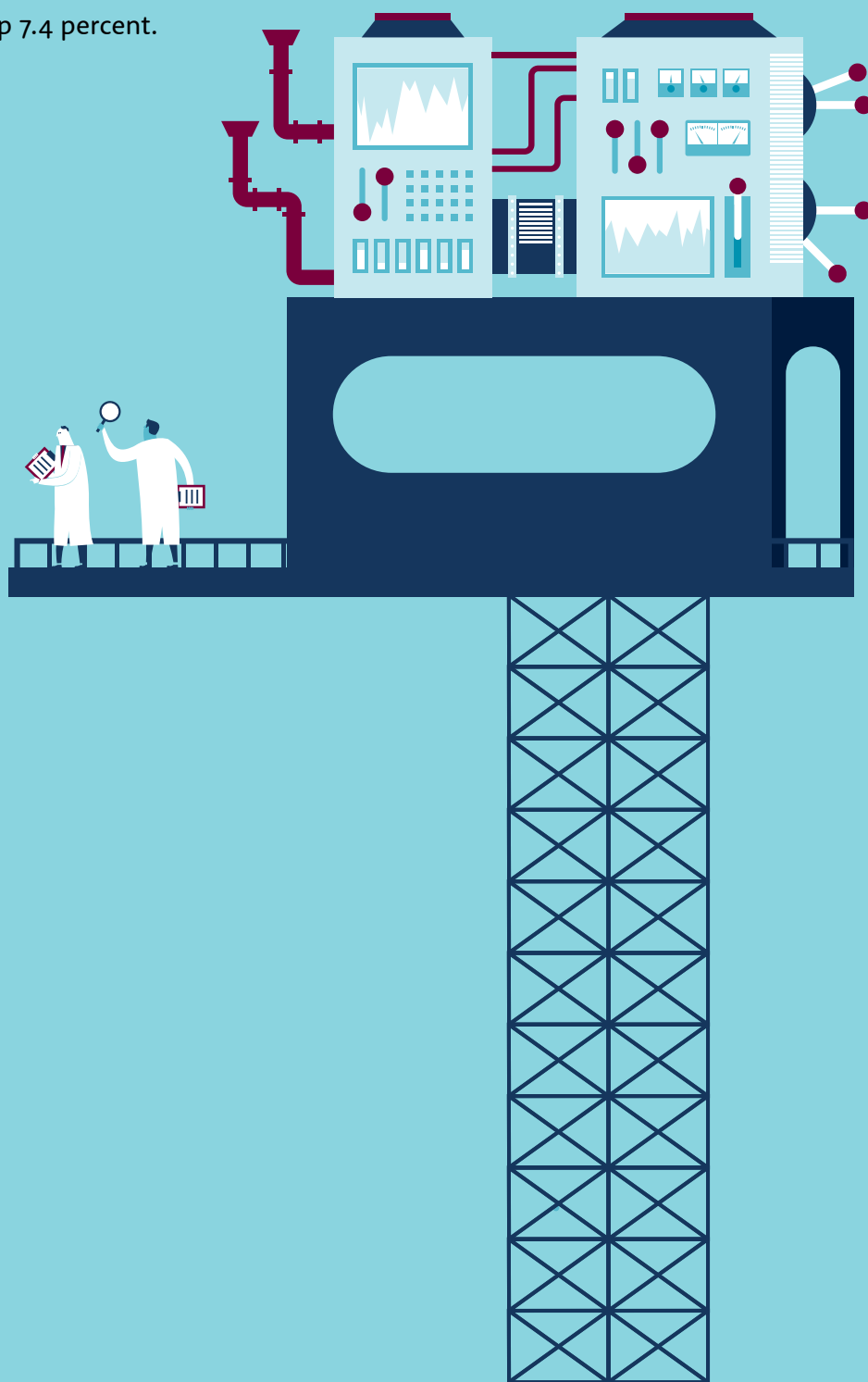
scientific and technical services. Overall, ICT constituted 61.2 percent (\$71.6 billion) of the tech sector’s contribution to GDP.

Figure 4:
Tech Sector GDP by Industry Group, 2015



Statistics Canada CANSIM Table 379_0031, BII+E Analysis

Many industries that we found were part of the tech sector but are not included in ICT contributed significantly to the tech sector's GDP. Combined, they made up 38.8 percent (\$45.5 billion) of the tech sector's output. Architecture, engineering and design made up 18.4 percent; chemical and pharmaceutical manufacturing made up 6.9 percent; and aerospace manufacturing made up 6.1 percent. The remaining industries, scientific R&D and machinery and specialized manufacturing, combined made up 7.4 percent.

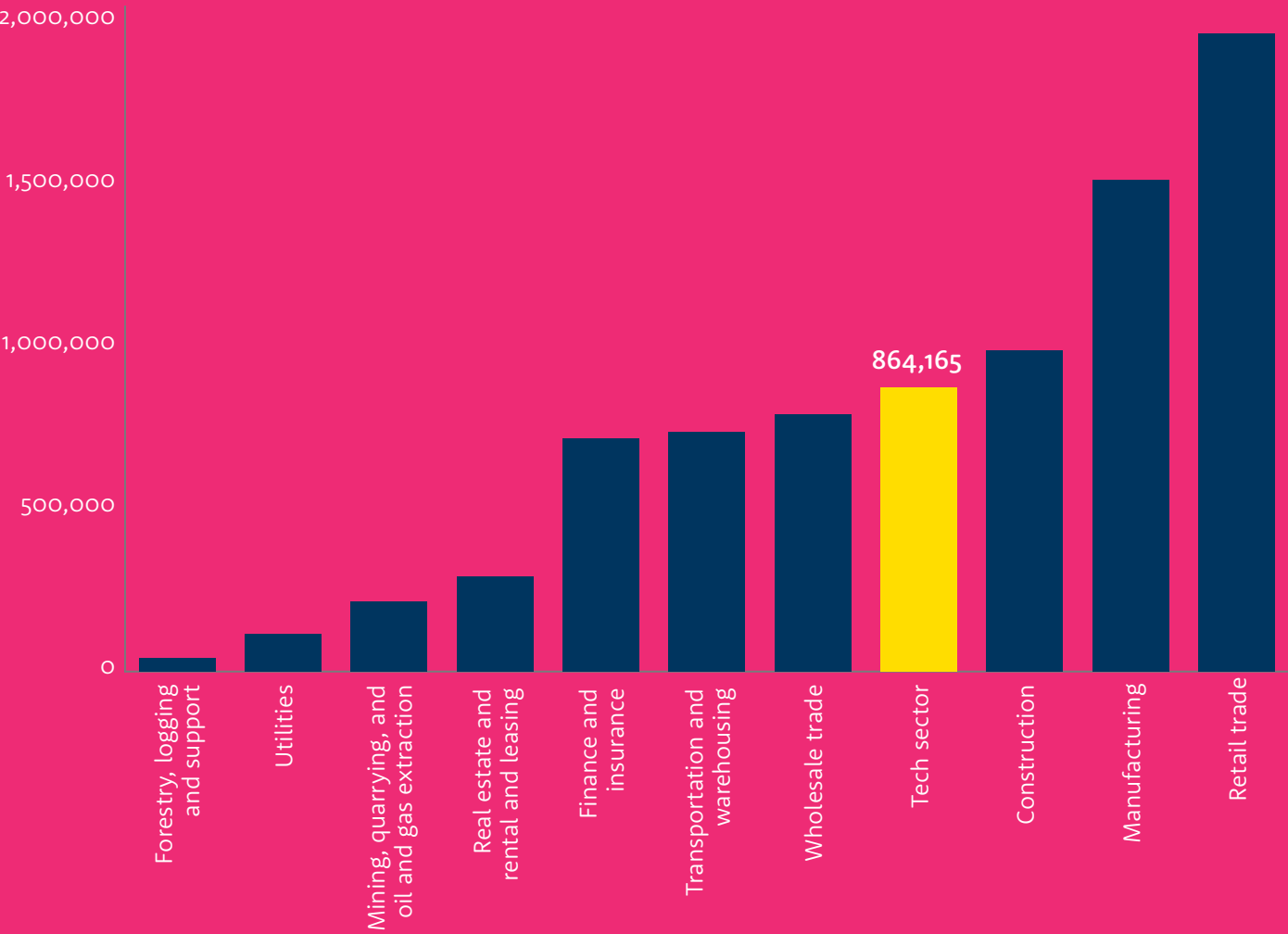


EMPLOYMENT

The tech sector is responsible for a substantial portion of Canada’s employment. In 2015, it had just over 864,000 employees, which made up 5.6 percent of Canada’s total employment. The tech sector employed just over 153,000 more

Canadians than the finance and insurance industry and 652,000 more than mining, quarrying, and oil and gas extraction. It was, however, vastly exceeded in terms of employment by retail trade, manufacturing and construction.

Figure 5:
Employment by Sector, 2015



Statistics Canada CANSIM Table 281 0024, BII+E Analysis

For these figures, we used Statistics Canada’s Survey of Employment, Payrolls and Hours (SEPH). While this survey excludes farm employment and the self employed, the SEPH employment data is important to set the context because of its reliability, lack of sampling errors and ability to

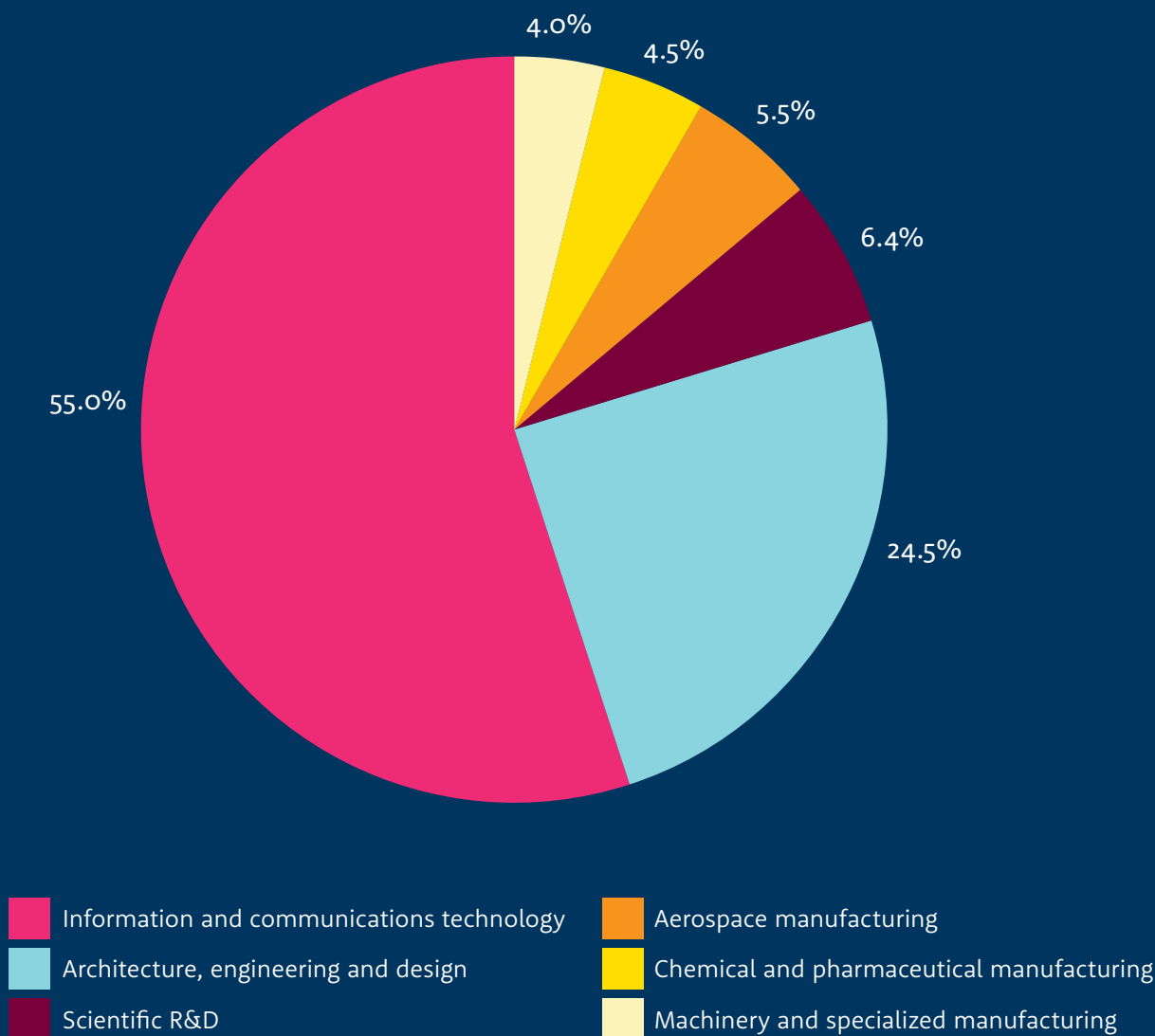
gather more detailed industry data at the national and provincial levels. In the *Profiling Canada’s Cities* section, we use Statistics Canada’s Labour Force Survey (LFS) for a more regional employment perspective.

Similar to GDP, ICT accounted for the majority of employment in the tech sector, with over 475,000 employees in 2015. Under the ICT umbrella, computer systems design and related services made up the vast majority of employment.

Jobs in non ICT tech industries comprised 45 percent or nearly 389,000 tech sector employees.

Of these, architecture, engineering and design made up the largest portion, at nearly 24.5 percent of total tech sector employment or just over 212,000 jobs. Scientific R&D and aerospace manufacturing also made up a large proportion of total tech sector employment at 11.9 percent or nearly 103,000 jobs.

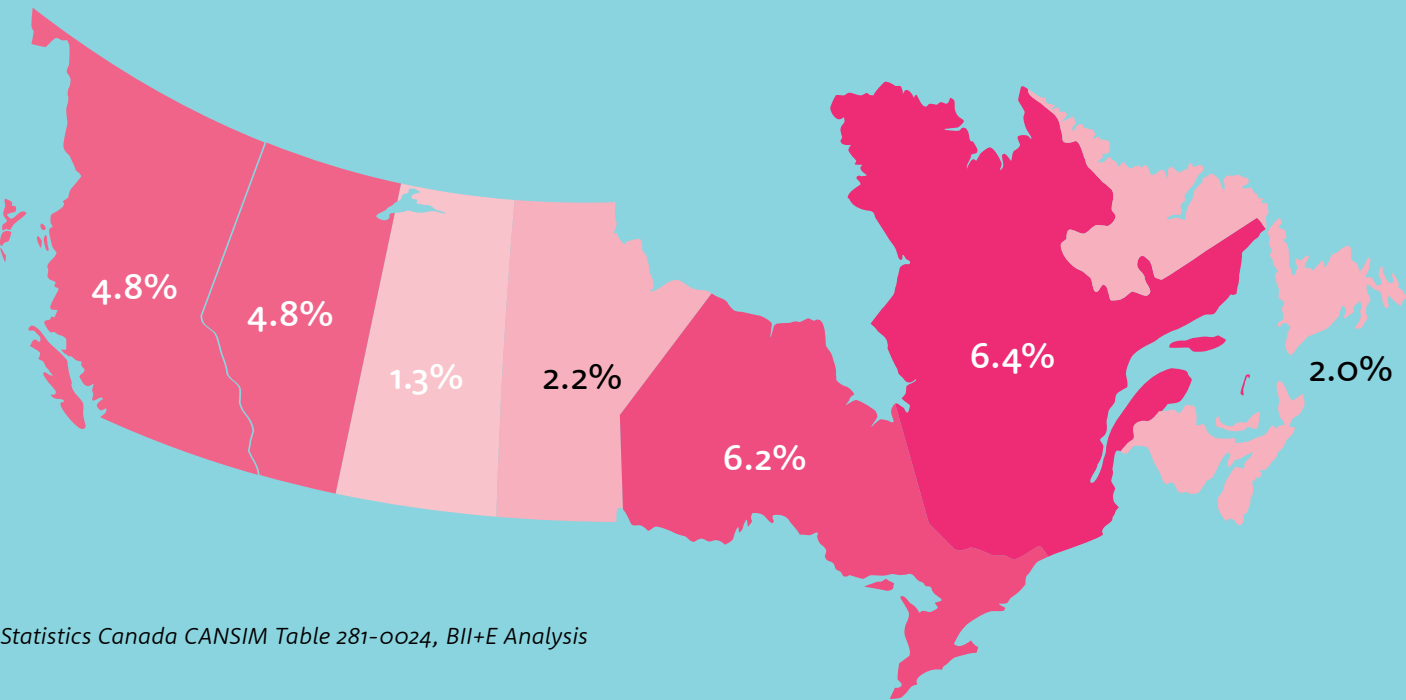
Figure 6:
Tech Sector Employment by Industry Group, 2015



When the tech sector as a proportion of total provincial employment is compared across the country, there are three major groupings of provinces. Ontario and Quebec led among the provinces with more than 6 percent of total provincial employment in the tech sector. This was followed by British Columbia and Alberta, where the tech sector represented 4.8 percent of total

employment. Finally, in Manitoba, the Atlantic provinces, and Saskatchewan, proportions of tech sector employment ranged between 1.3 and 2.2 percent. Due to data limitations, the Atlantic provinces were combined to better compare Atlantic Canada’s performance against the other provinces.

Figure 7:
Tech Sector as a Proportion of Provincial Employment, 2015



Statistics Canada CANSIM Table 281-0024, BII+E Analysis

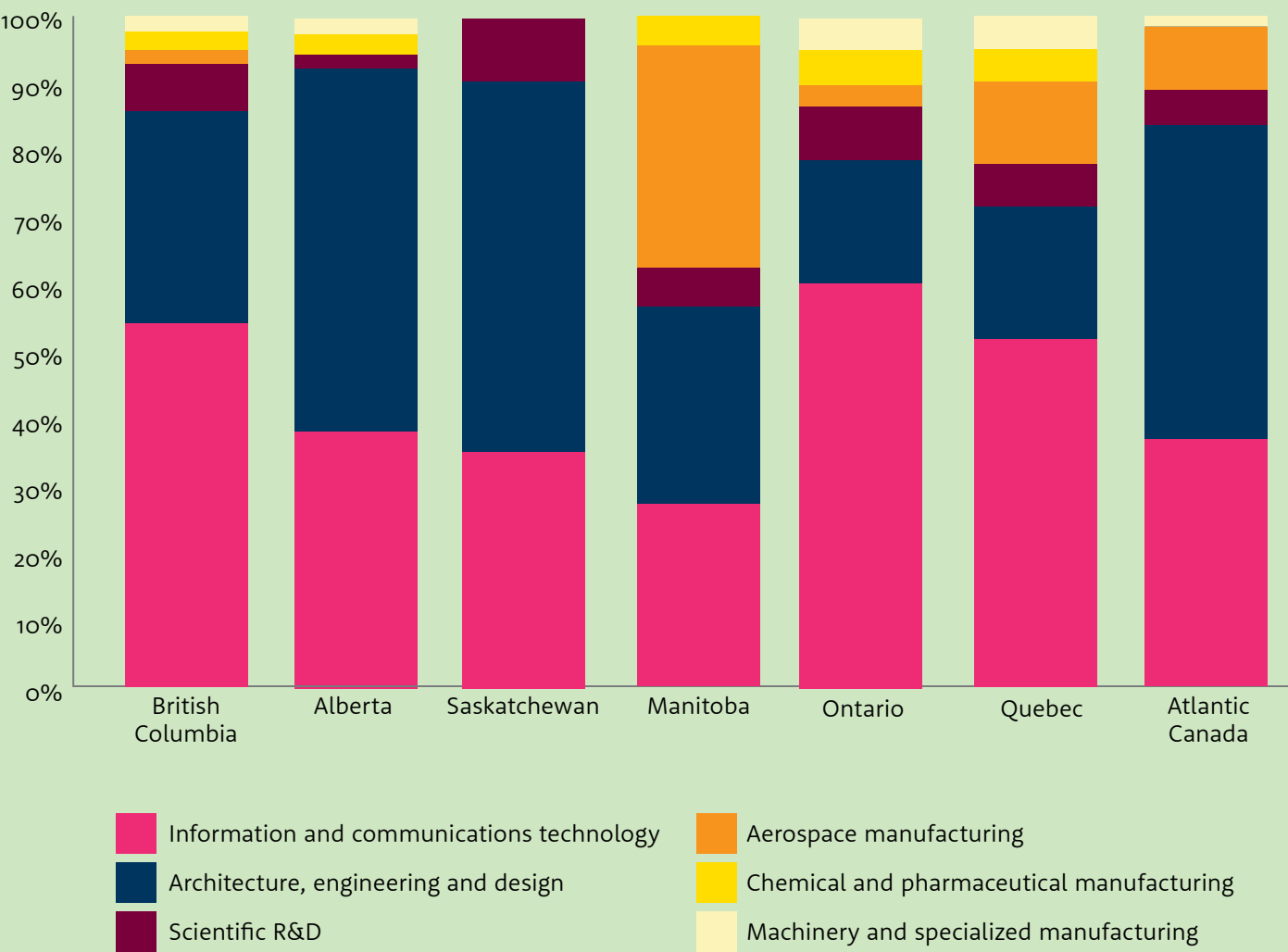
Breaking down provincial tech sector employment reveals several interesting trends. ICT remains a principal driver of tech sector employment across most provinces, with Manitoba being the most significant exception.

Aerospace manufacturing constituted a considerable amount of tech sector employment in the Atlantic provinces, Manitoba and Quebec.

In Quebec, aerospace manufacturing was the third largest tech sector employer with nearly 27,000 jobs. Architecture, engineering and design made up a large proportion of tech sector employment in Saskatchewan, the Atlantic provinces and Alberta. In fact, architecture, engineering and design made up slightly more than half of Alberta's tech sector employment with over 52,000 jobs.

Figure 8:

Tech Sector Employment by Province



Statistics Canada CANSIM Table 281-0024, 2015, BII+E Analysis



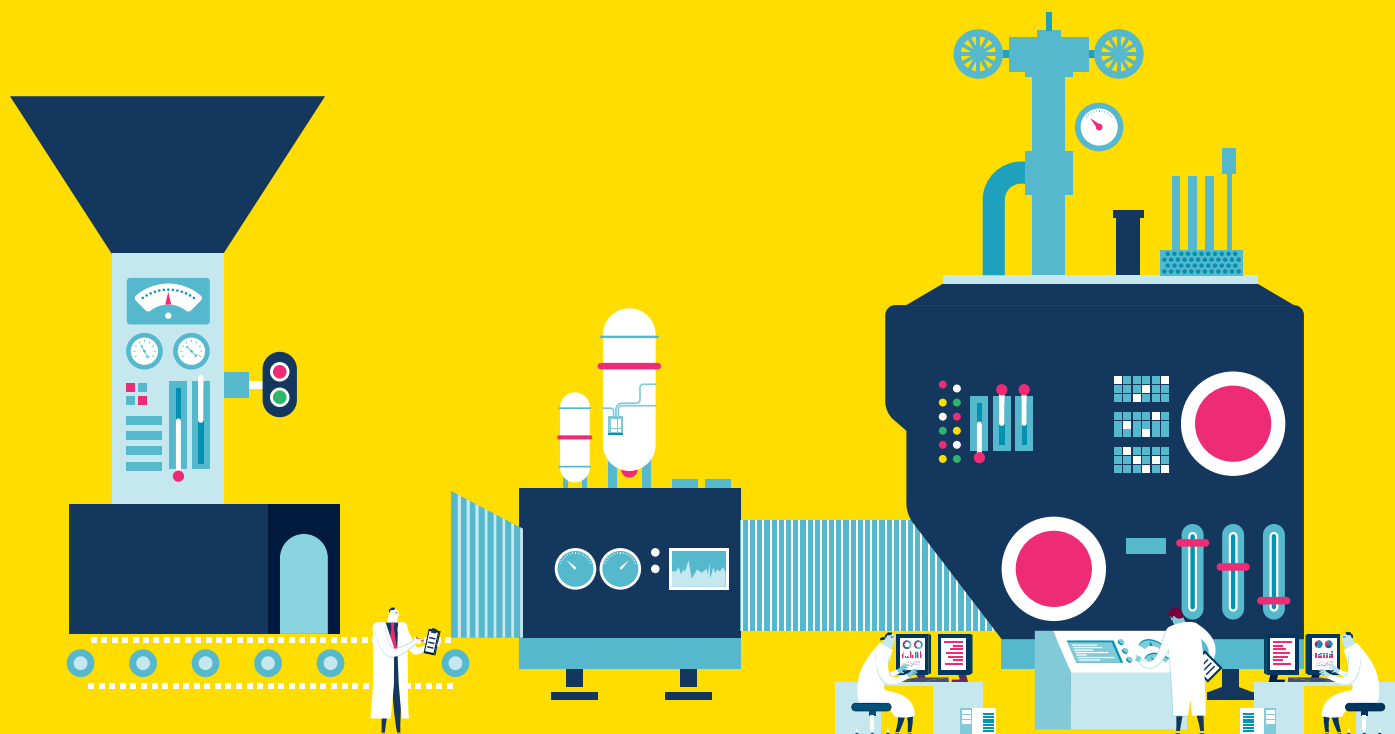
Table 1:

Proportion of Tech Sector Employment by Province

	Information and communications technology	Architecture, engineering and design	Scientific R&D	Aerospace manufacturing	Chemical and pharmaceutical manufacturing	Machinery and specialized manufacturing
Saskatchewan	35.3%	55.3%	9.4%	0.0%	0.0%	0.0%
Atlantic Canada	36.9%	46.9%	5.2%	9.5%	0.0%	1.6%
Manitoba	27.1%	29.5%	5.8%	33.1%	4.4%	0.0%
Alberta	38.4%	54.2%	2.0%	0.0%	3.0%	2.4%
British Columbia	54.2%	31.6%	7.2%	2.0%	2.7%	2.3%
Quebec	51.8%	19.7%	6.5%	12.2%	4.9%	5.0%
Ontario	60.5%	18.4%	8.0%	3.1%	5.3%	4.6%

PRODUCTIVITY AND INNOVATION

At over \$9.1 billion, the tech sector was by far the largest private investor in business enterprise R&D in 2015.



Productivity is generally considered the most important driver of long-run economic growth and prosperity.³ According to the OECD, “it reflects our ability to produce more output by better combining inputs, owing to new ideas, technological innovations and business models.”⁴ Productivity is often measured using GDP produced per hour worked.

Innovation is a key ingredient of productivity growth, and refers to the development of a new product, process or service that has social or economic value.⁵ According to the Council of Canadian Academies:

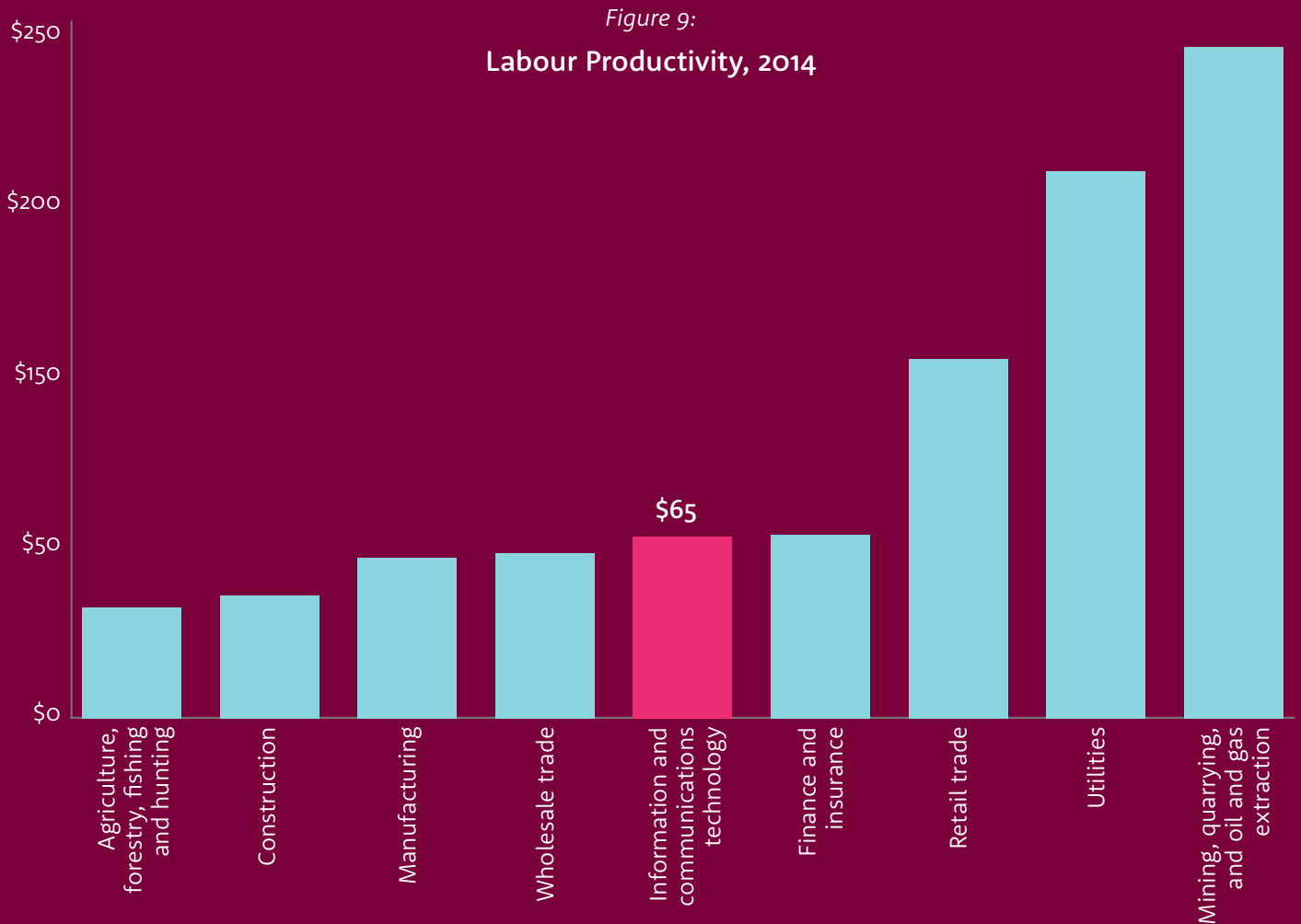
innovation drives an economy’s ability to create more economic value from an hour of work, thereby increasing economic output

per capita. The resulting productivity growth creates the potential for rising wages and incomes, and thus for a higher standard of living.⁶

Examining productivity and innovation is especially important given that labour productivity levels in Canada have consistently lagged behind other international comparators. In 2014, Canadian labour productivity was 71 percent of that of the United States and has remained below the 80 percent threshold since 2003.⁷

Since the tech sector has long been considered to be at the forefront of the development and commercialization of breakthrough technologies and rapid innovation, the following section attempts to quantify its impact on Canada’s productivity and innovation.

PRODUCTIVITY



Statistics Canada CANSIM Table 383-0029, BII+E Analysis

Note: Labour productivity is measured in chained 2007 dollars per hour

Productivity data was not available for our custom definition of the tech sector, therefore Statistics Canada's ICT definition was used as a proxy. Compared to other industries, ICT is not a particularly high performer in terms of labour productivity, defined as the ratio between real value added and hours worked.

In 2014, ICT productivity outperformed manufacturing, construction and agriculture, as well as forestry, fishing and hunting. ICT also performed at 99 percent of the productivity level of finance and insurance. However, it was vastly exceeded by real estate as well as utilities, mining and oil and gas extraction. This demonstrates that, much like the overall Canadian labour market, there is significant room for improvement in terms of productivity in the ICT sector.

To attempt to explain this low productivity performance, it is important to examine firm size in the tech sector. In the *Firm Size* section of the report, we demonstrate that the tech sector is disproportionately comprised of very small firms. This is significant, since the evidence suggests that the larger a firm, the more productive it is. This relationship is especially evident in manufacturing, which is an important component of the tech sector.⁸ A 2014 Statistics Canada report (*Catalogue no. 15 206 X – No. 033*) found that the disproportionate level of small firms in Canada as compared to the United States accounted for most of the labour productivity gap between the two countries in 2002, and about 67 percent of the gap in 2008.⁹ This suggests that to improve the productivity performance of the ICT sector it is important to scale and sustain large domestic firms.

INNOVATION

Despite the relatively low productivity in ICT, the tech sector is exceptionally innovative, performing above all other sectors when it comes to a number of important indicators of innovation.

Research & Development (R&D)

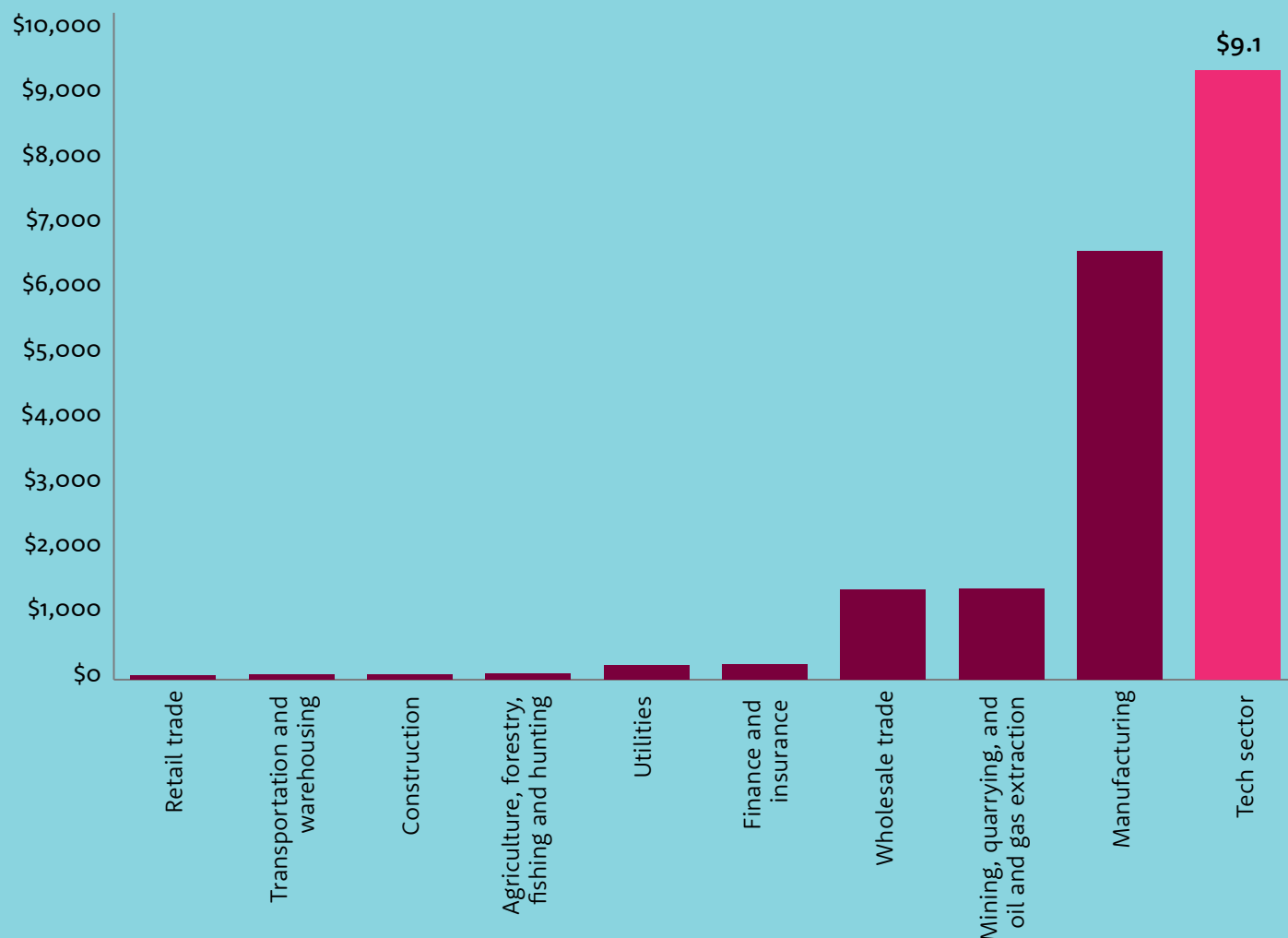
Business enterprise R&D, commonly referred to as BERD, is a measure of the resources a firm commits to developing new products, processes or services. While BERD is an indication of a firm's overall commitment to innovation, it is important to note

that there is not necessarily a perfect relationship between the two measures. It is not unusual for firms to innovate without any formal R&D and results from R&D are not always guaranteed.^{10 11} Despite this, BERD is considered a significant input into innovation.^{12 13}

At over \$9.1 billion, the tech sector was by far the largest private investor in BERD in 2015. This investment comprised over \$2.7 billion more than the entire manufacturing industry and \$7.8 billion more than mining, quarrying, and oil and gas extraction.

Figure 10:

Total Business Enterprise Research and Development (BERD), 2015 (\$1B)

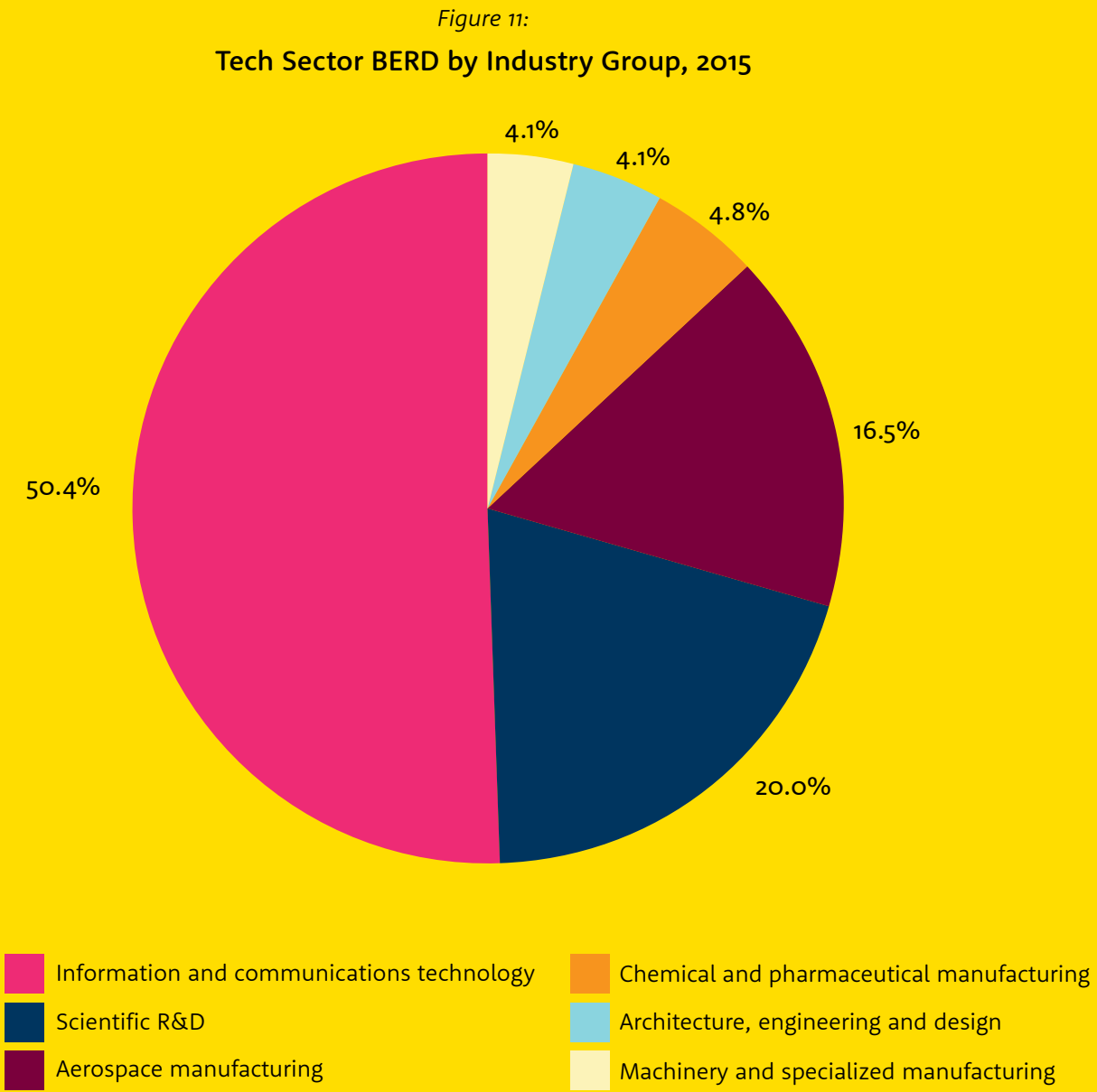


Statistics Canada CANSIM Table 358-0024, BII+E Analysis

Note: Due to data limitations, this figure excludes three tech industries: basic chemical manufacturing (NAICS code 3251), audio and video equipment manufacturing (NAICS code 3343), and specialized design services (NAICS code 5414)

The tech sector’s large R&D investments are significant given that Canada’s private sector R&D has consistently lagged international comparators. Overall, BERD intensity in Canada has declined since 2006. Canada is now ranked 26th out of 41 international peers, sitting at 36 percent of the threshold of the five top-ranking countries.¹⁴ This suggests that while all industries must contribute to improve Canada’s BERD performance, it is essential to consider the needs of the tech sector.

When breaking down the tech sector’s R&D contributors, ICT comprised 50.4 percent of tech sector BERD. Scientific R&D and aerospace manufacturing combined made up 36.5 percent of tech sector BERD. The remaining R&D was almost evenly split between machinery and specialized manufacturing, architecture, engineering, and design, as well as chemical and pharmaceutical manufacturing.



Statistics Canada CANSIM Table 358-0024, BII+E Analysis

Product, Process or Organizational Innovation

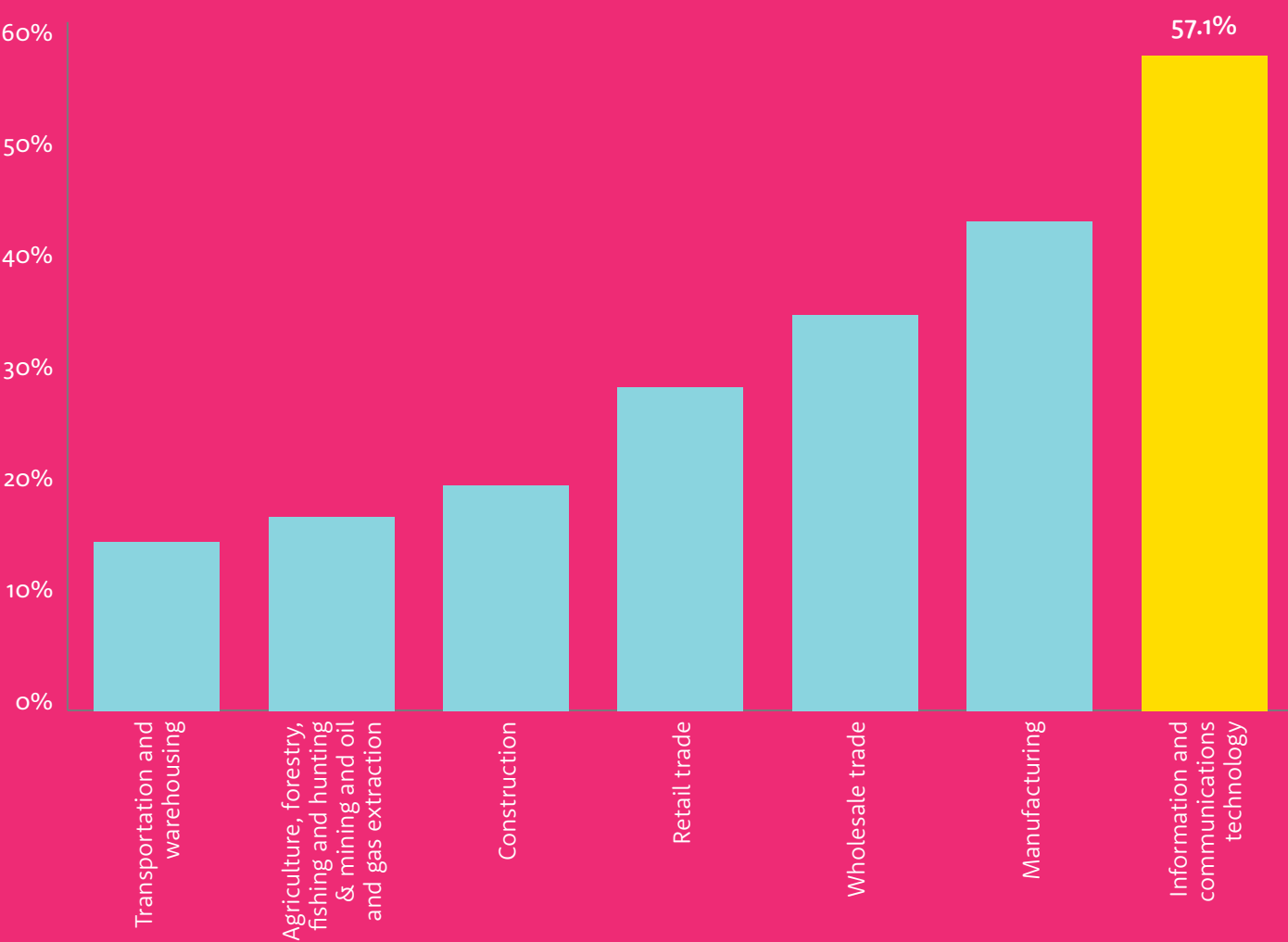
In addition to R&D, innovation can also be measured by whether or not a firm has been directly involved in a product, process or organizational innovation.

The following data comes from Statistics Canada’s Survey of Financing and Growth of Small and

Medium Enterprises, 2014. The estimates from this 2014 survey were generated from firms with 1 to 499 employees with an annual gross revenue of \$30,000 or more. For this survey, Statistics Canada does not break down firm responses by North American Industry Classification System (NAICS) codes; therefore, ICT was used as a proxy.

Figure 12:

Percent of Businesses that Introduced a **PRODUCT** Innovation in the Previous 3 Years, 2014

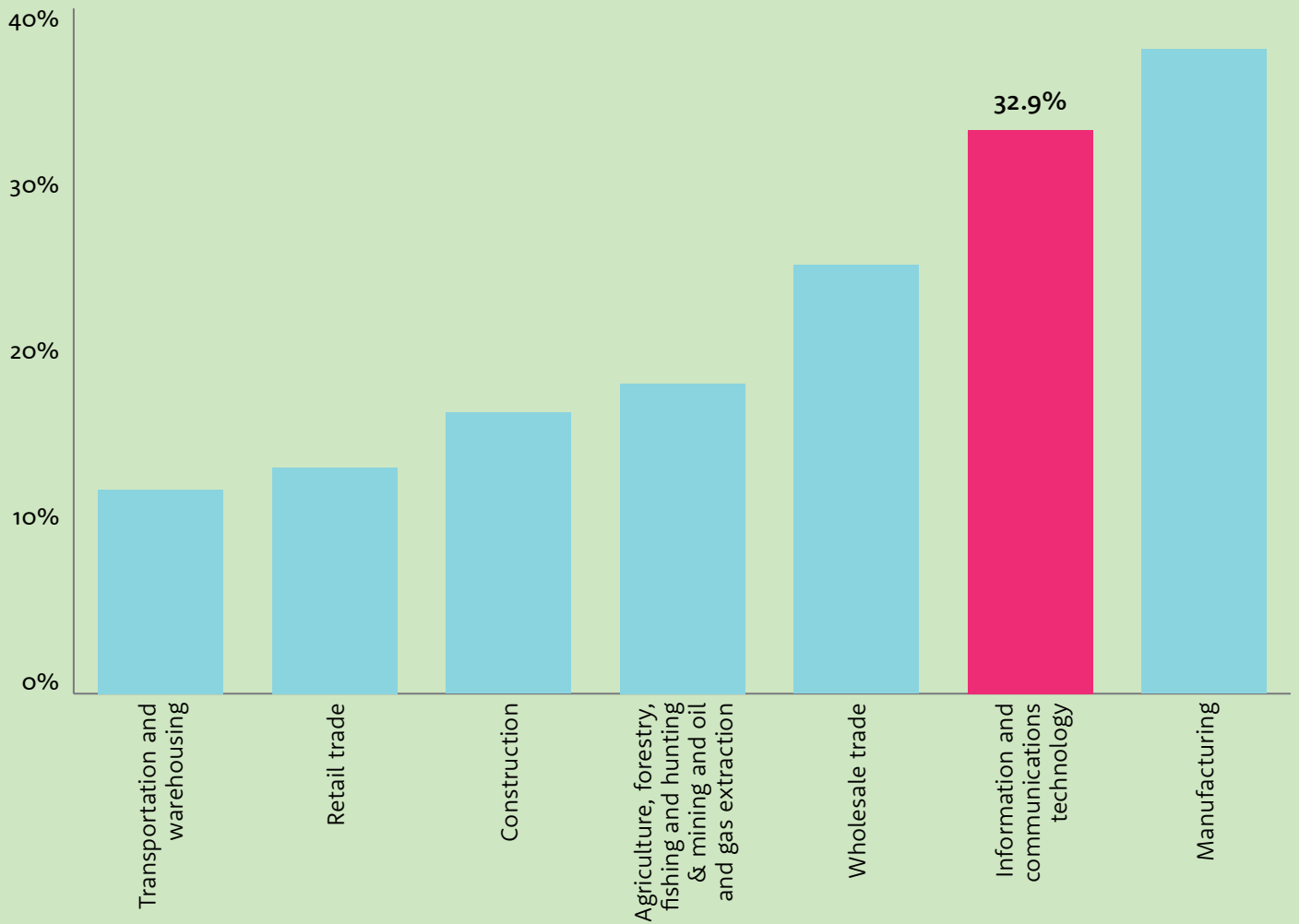


Statistics Canada Survey of Financing and Growth of Small and Medium Enterprises, BII+E Analysis



Figure 13:

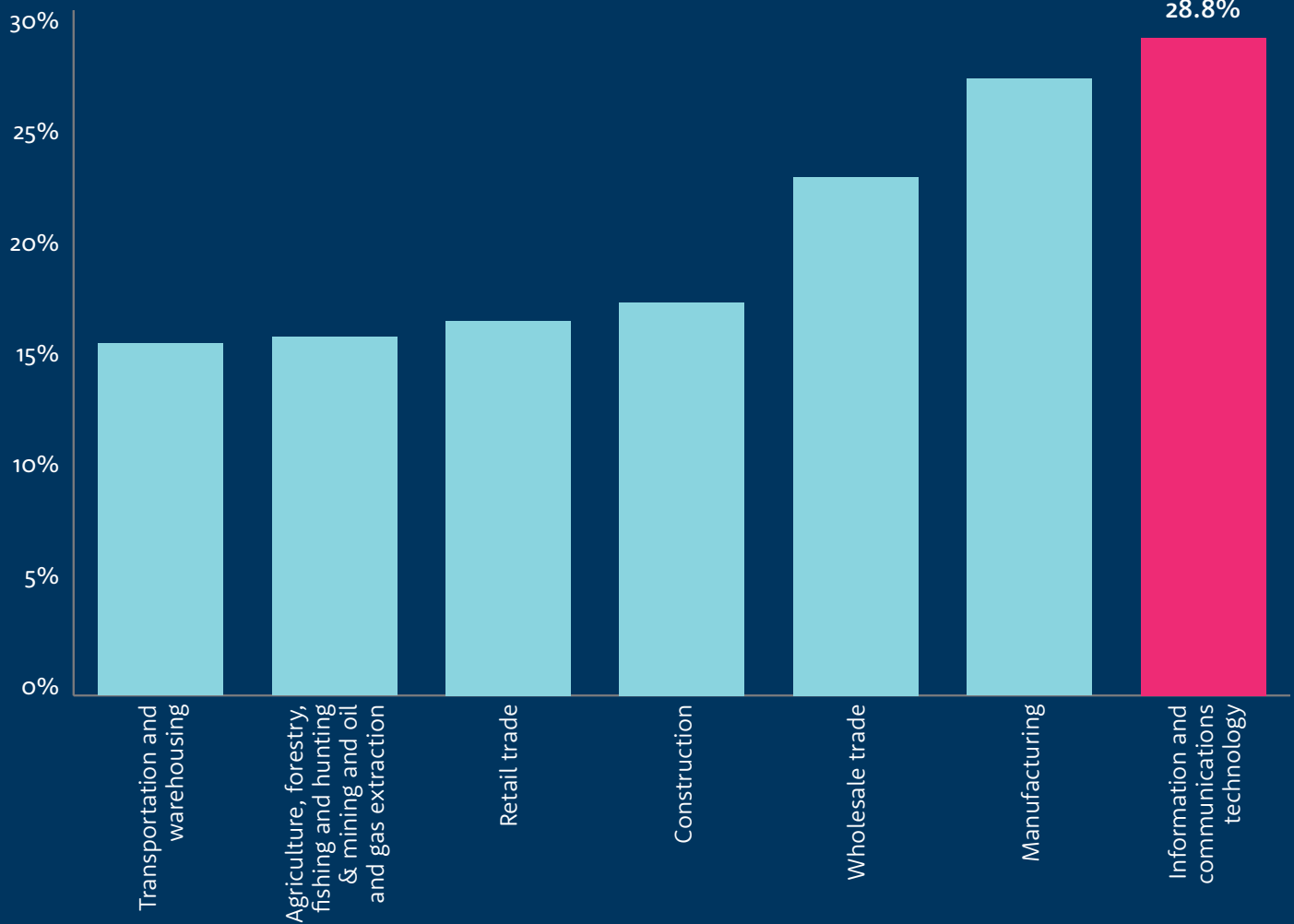
**Percent of Businesses that Introduced a
PROCESS Innovation in the Previous 3 Years, 2014**



Statistics Canada Survey of Financing and Growth of Small and Medium Enterprises, BII+E Analysis

Figure 14:

Percent of Businesses that Introduced an
ORGANIZATIONAL Innovation in the Previous 3 Years, 2014



Statistics Canada Survey of Financing and Growth of Small and Medium Enterprises, BII+E Analysis

According to the survey, ICT firms were more likely than a firm in any other sector to have introduced a new or significantly improved good or service, with 57.1 percent of firms claiming to have been involved in some form of product innovation in the three years prior to being surveyed. The ICT sector was also more likely than all others industries to report the development of a new organizational method in their business practices, workplace organization or external relations, with 28.8 percent of firms claiming to have been involved in some form of organizational innovation in the three years prior to being surveyed.

The ICT sector was also just behind manufacturing in terms of reporting a new or significantly improved production process or method in the 3 years prior to being surveyed. This indicates that the ICT sector is reliant on continuous product, process and organizational innovation to remain competitive.

COMPOSITION OF THE TECH SECTOR

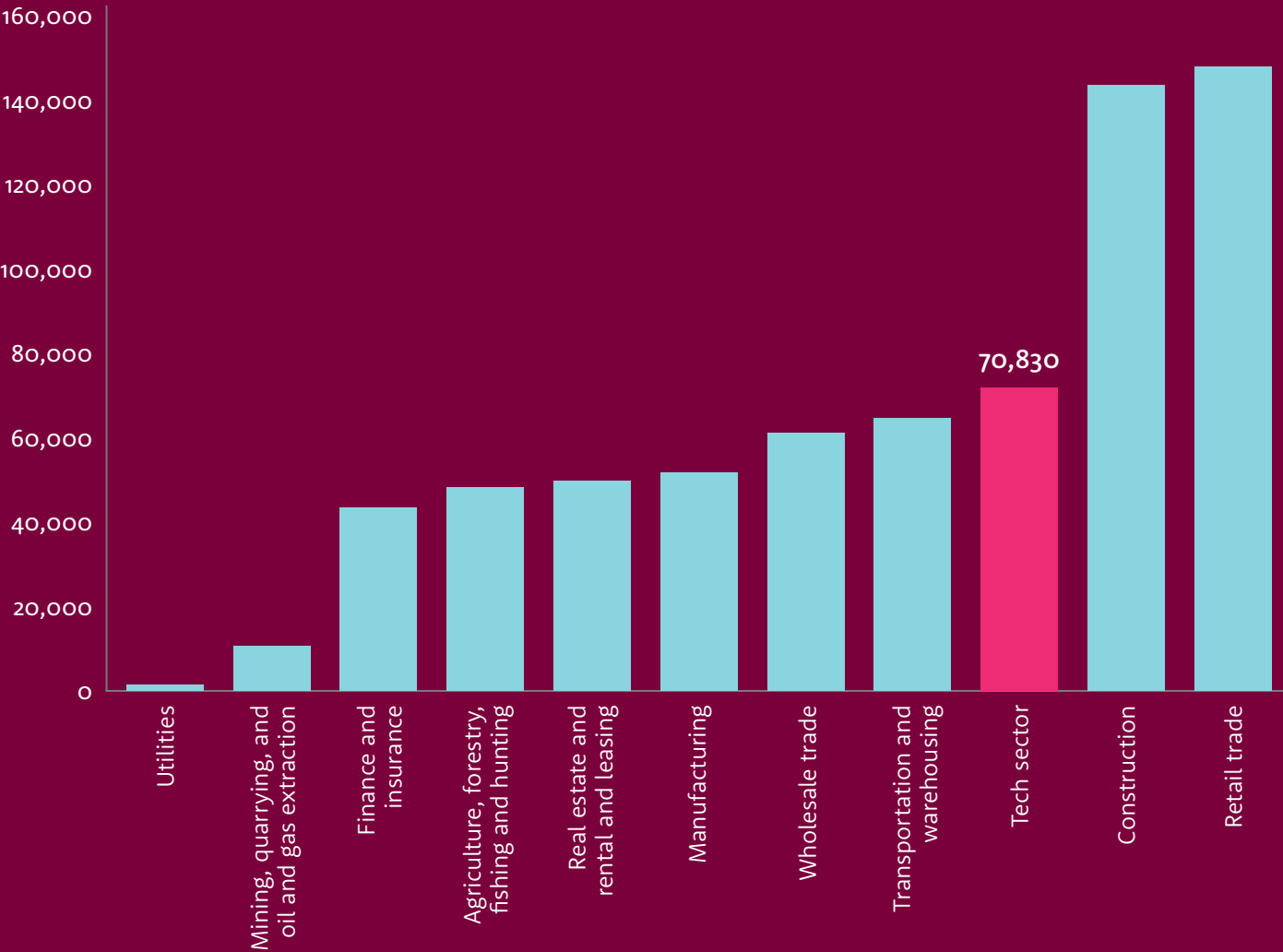
Tech sector firms are primarily small, dispersed throughout the country, profitable and fast-growing.



Tech sector firms can be found across Canada, representing 6.1 percent of all Canadian businesses. They are primarily small, dispersed throughout the country, profitable and fast-growing. The following indicators outline some of the key firm-level data from the tech sector.

BUSINESS COUNTS

Figure 15:
Business Counts, December 2015



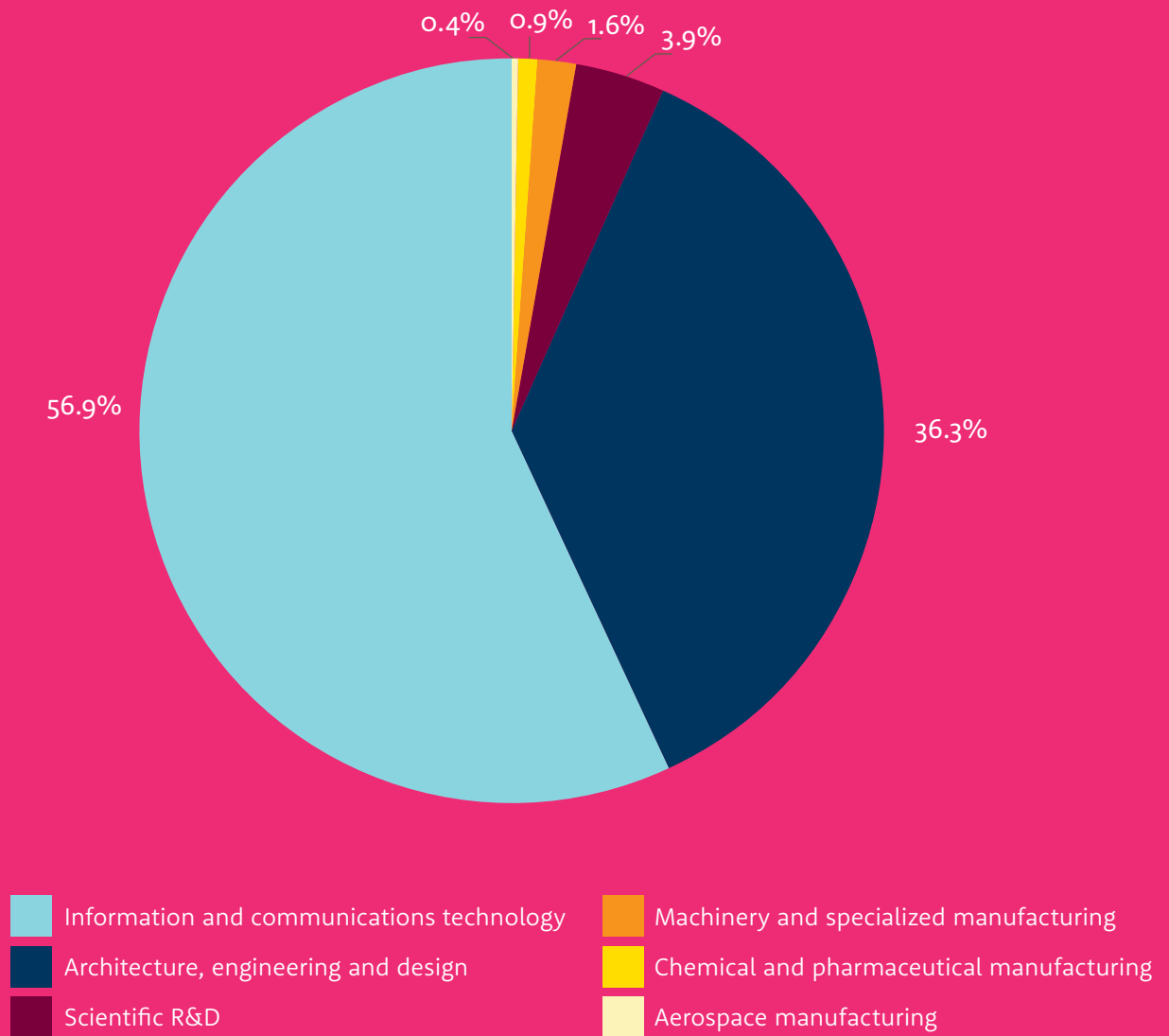
Statistics Canada CANSIM Table 551 0006, BII+E Analysis

In 2015, the tech sector was comprised of nearly 71,000 firms. This figure is above transportation and warehousing and wholesale trade, but is exceeded by construction and retail trade. In order to be counted, a firm must have a minimum of

\$30,000 in annual income or be incorporated under a federal or provincial act, have filed a federal corporate income tax form within the past three years, and have at least one employee.



Figure 16:
Tech Sector Business Counts by Industry Group, December 2015



Statistics Canada CANSIM Table 551 0006, BII+E Analysis

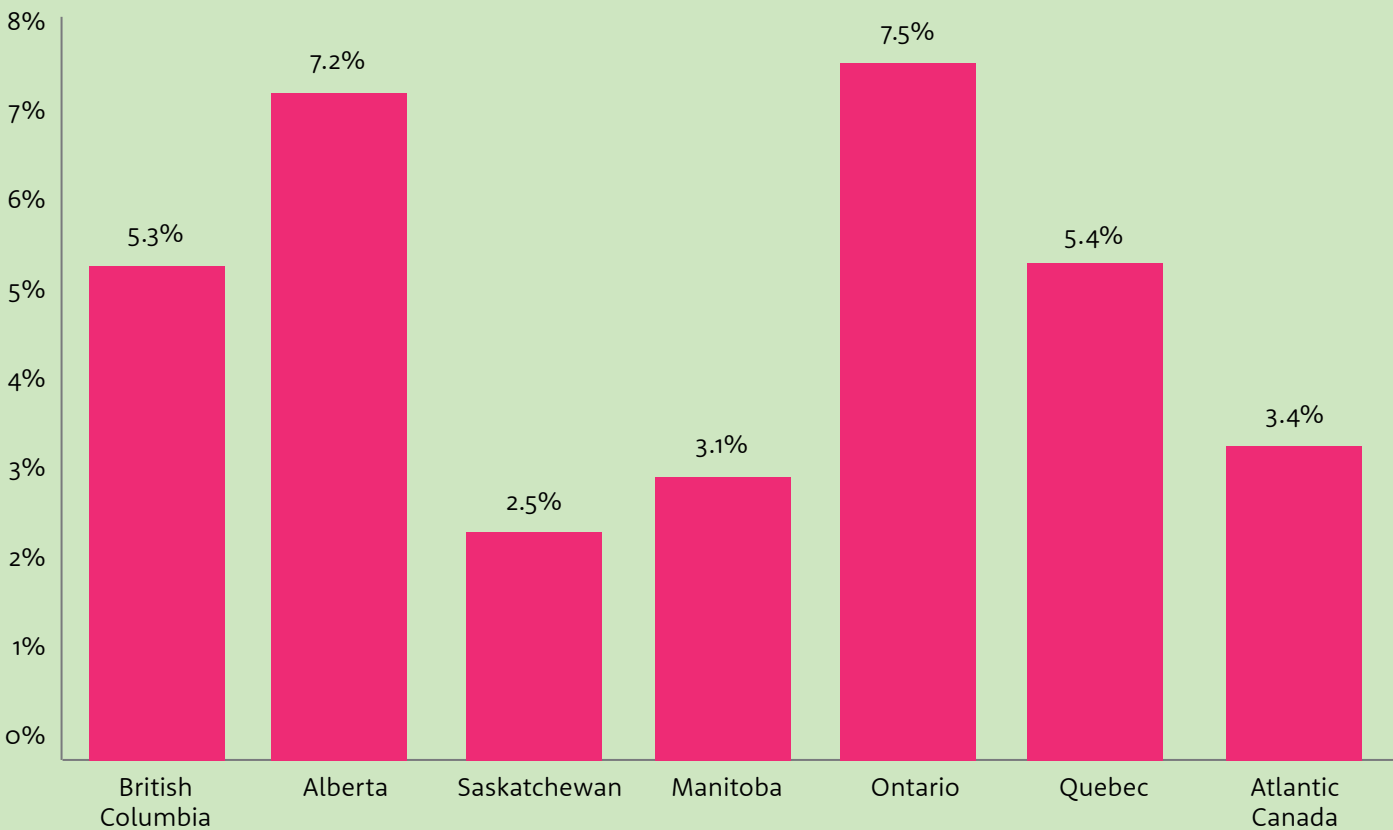
The majority of tech sector firms are in ICT. In 2015, there were over 40,000 ICT firms. Under the ICT umbrella, computer systems design and related services made up the largest portion at just over 30,000 firms.

Non ICT industries constituted nearly 31,000 tech sector firms. Architecture, engineering and design had nearly 26,000 firms. This industry was distantly followed by scientific R&D with nearly 3,000 firms.

When comparing business locations and employment in the tech sector, there were some notable differences. This helps us understand firm size in each tech sector industry. ICT occupies a very similar proportion of tech sector employment and business location counts. However, architecture, engineering and design made up nearly 25 percent of tech sector employment,

yet comprised over 36 percent of all tech firms, indicating this industry is comprised of many small firms. In contrast, aerospace manufacturing firms made up 0.4 percent of tech firms and over 5 percent of total tech sector employment, suggesting that aerospace manufacturing is likely to be made up of larger firms.

Figure 17:
Tech Sector as a Proportion of Total Businesses by Province, December 2015



Statistics Canada CANSIM Table 551-0006, BII+E Analysis

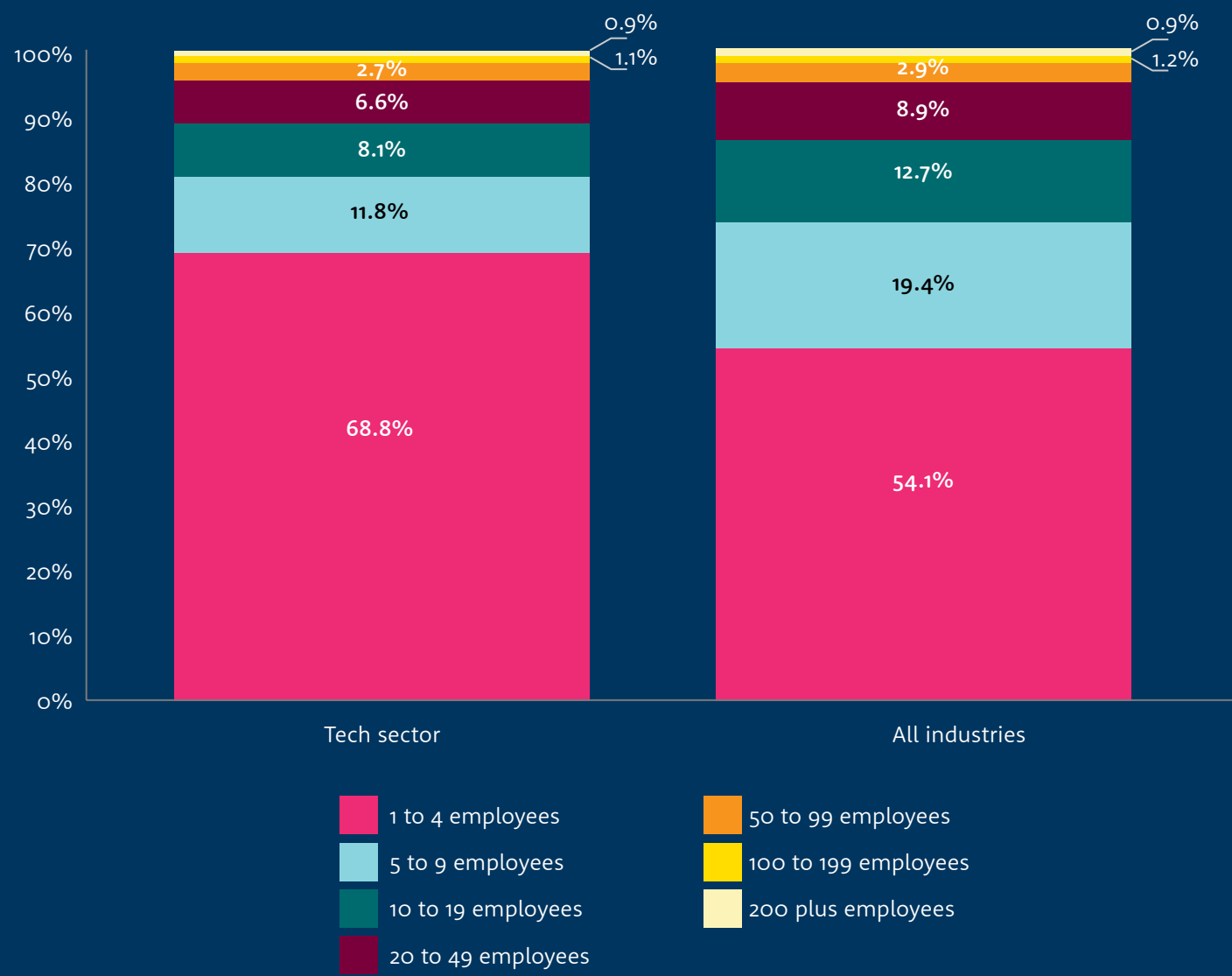
Referring to Figure 17, the proportion of tech firms relative to the provinces’ total number of firms was highest in Ontario and Alberta at 7.5 and 7.2

percent, respectively. This was followed by Quebec at 5.4 percent and British Columbia at 5.3 percent.

FIRM SIZE

Figure 18:

Distribution of Firm Sizes, December 2015



Statistics Canada CANSIM Table 551 0006, BII+E Analysis

When compared to all other Canadian industries, Canada’s tech sector is comprised of a disproportionate number of very small firms. In 2015, 68.8 percent of all tech sector firms with staff had four or fewer employees, compared to 54.1 percent across all other industries.

The high number of micro firms in the tech sector was primarily driven by ICT and architecture, engineering and design. These industries were also

a principal driver of the number of tech sector firms in all business size categories with a few notable exceptions. For example, aerospace manufacturing constituted the fewest number of absolute firms in the tech sector in 2015, but ranked fourth in terms of firms with 500 plus employees.

In contrast to the high number of small firms, the tech sector was consistently exceeded in terms of the number of medium and large firms by

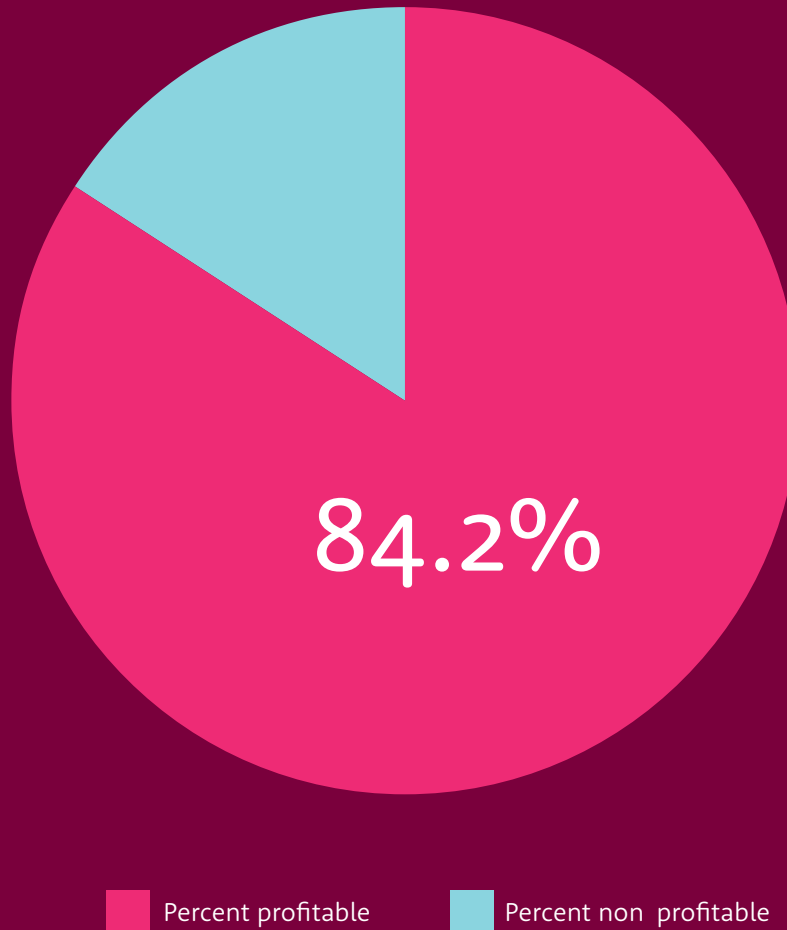
the manufacturing sector. Retail trade also had substantially more medium-sized firms than the tech sector. This implies that relative to other industries, Canada's tech firms may be less resilient and unable to take full advantage of economies of scale because they are not as large. However, this may also suggest that many tech firms are still young startups that have substantial growth potential. But due to data limitations, we were not able to track firm growth over time, which is a critical component for identifying and tracking startup activity.



FINANCIAL PERFORMANCE

Figure 19:

Profitability of Tech Sector Businesses with Revenue of \$30,000 – \$5,000,000, 2014



Statistics Canada – Small Business Profiles, 2014, BII+E Analysis

When analyzing a sector, financial performance is an important indicator of overall firm health. Our analysis was limited to data for firms with annual revenues between \$30,000 and \$5 million. While this obscures total revenue figures, it does provide useful data on profitability.

Using this data, 84.2 percent of tech sector firms captured were profitable, compared to 82.3 percent of those in the broader economy. This indicates that the tech sector not only makes up a large proportion of Canadian businesses, but the average tech sector firm (in the specified revenue range) is slightly more likely to be profitable than the average Canadian firm.

FIRM GROWTH

High-growth firms are defined as firms that have seen revenue or sales growth of 20 percent or more for three consecutive years. As might be expected, high-growth firms contribute more to job creation and economic growth than others. A seminal study by Nesta, a UK-based charity, demonstrated that 6 percent of businesses in the UK with the highest growth rates created half of all new jobs between 2002 and 2008.¹⁵

Firms in the tech sector are often associated with the potential for rapid growth and expansion. To test this, we used the aforementioned Statistics Canada’s Survey on Financing and Growth of Small and Medium Enterprises to study high-growth firms

in Canada. Again, due to data limitations, ICT was used as a proxy for the tech sector.

The data from this survey shows that ICT firms were much more likely to report high growth (20 percent or more revenue/sales growth per year) in the three years before being surveyed. An even larger proportion of ICT firms predicted that they would have high growth over the three years after being surveyed, indicating a higher level of ambition around revenue growth compared to the rest of the economy. This shows that ICT firms, and possibly firms belonging to the broader tech sector, have greater growth and growth prospects than their peers.

Figure 20:

High-Growth Firms Over the PREVIOUS 3 Years, 2014

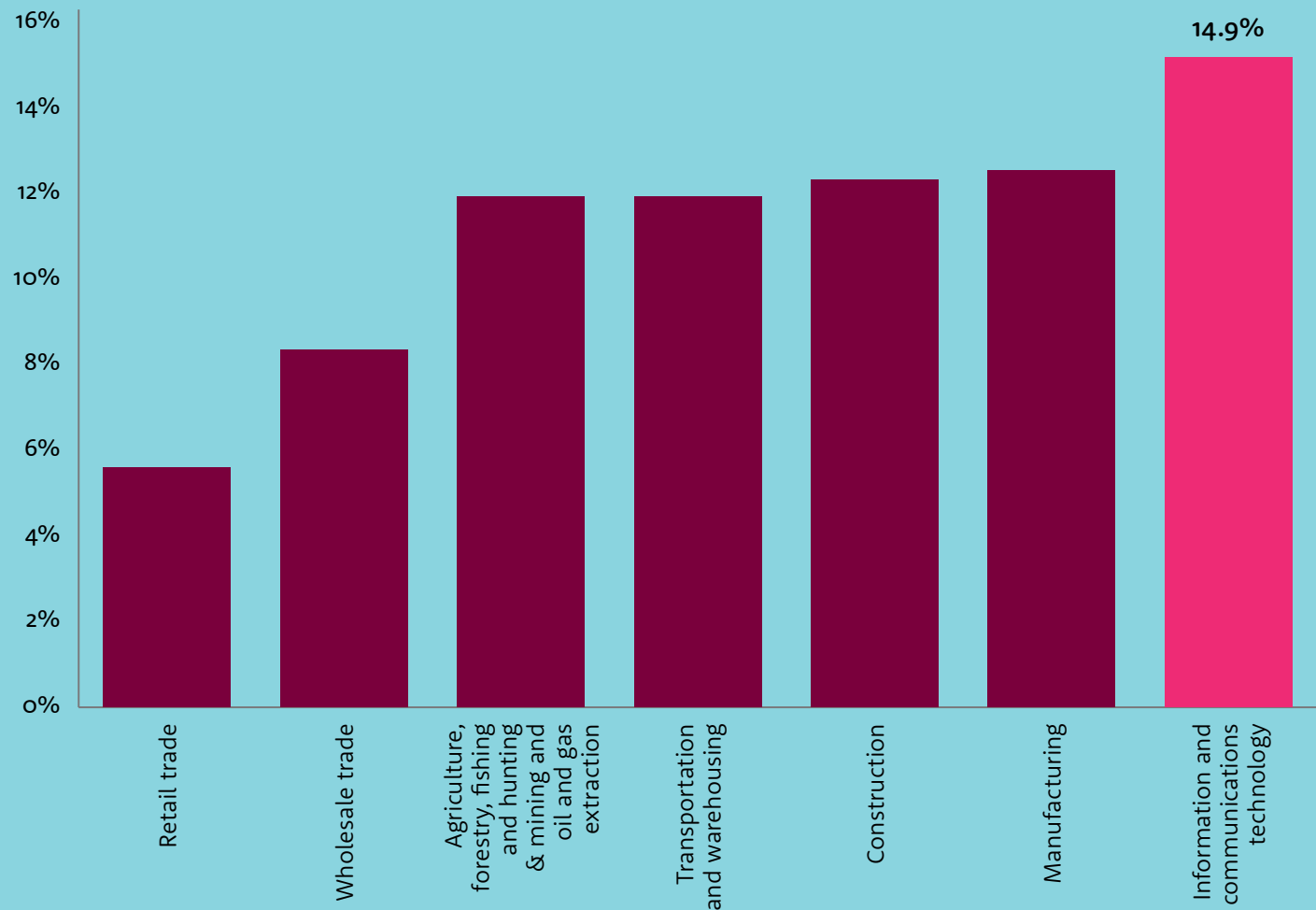
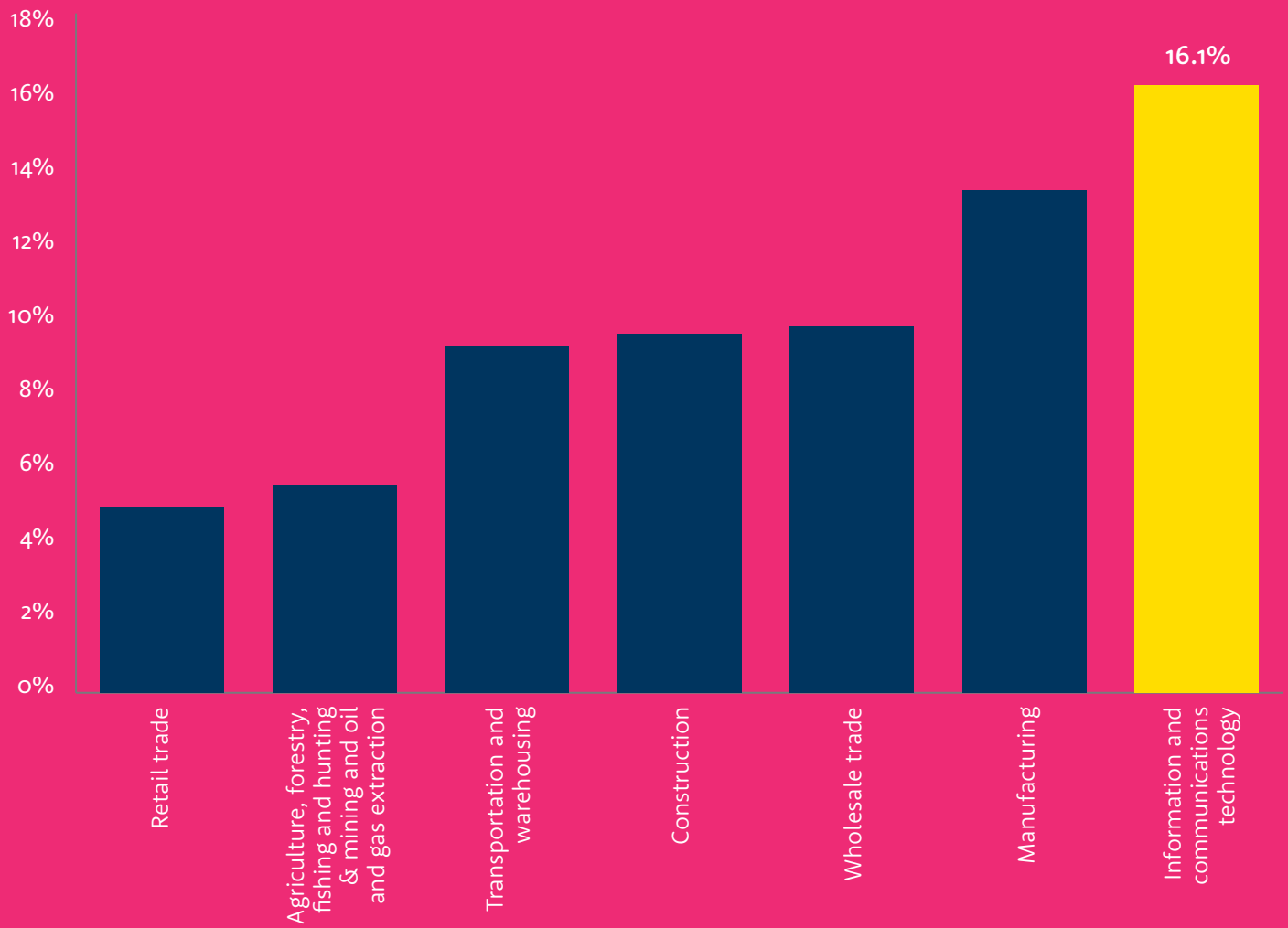


Figure 21:
High Growth Firms Over the NEXT 3 Years, 2014



Statistics Canada Survey of Financing and Growth of Small and Medium Enterprises, 2014, BII+E Analysis

TECH PROFESSIONALS

Canada's tech sector is comprised of a highly educated, high-earning workforce.

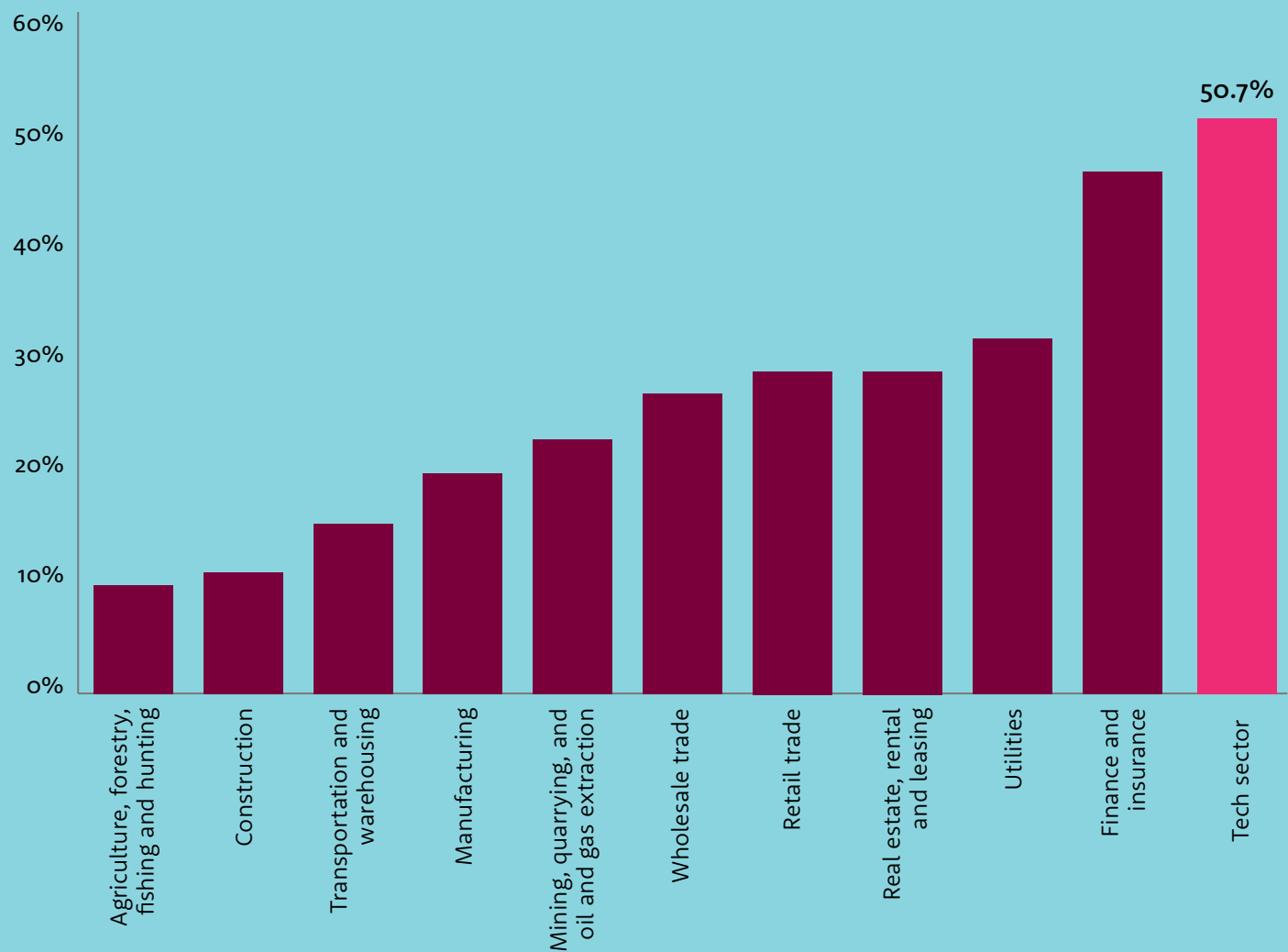


Employees in this sector are far more likely than those in the other industries studied to have a university education. They have the third highest annual wage. In addition, when compared to the rest of Canada's economy, they are more likely to be prime aged workers – aged between 25 and 54. The following section details some important aspects of the average tech sector employee.

EDUCATION

Figure 22:

Proportion of Labour Force with a University Degree, 2015



Statistics Canada Labour Force Survey Custom Tabulation, BII+E Analysis

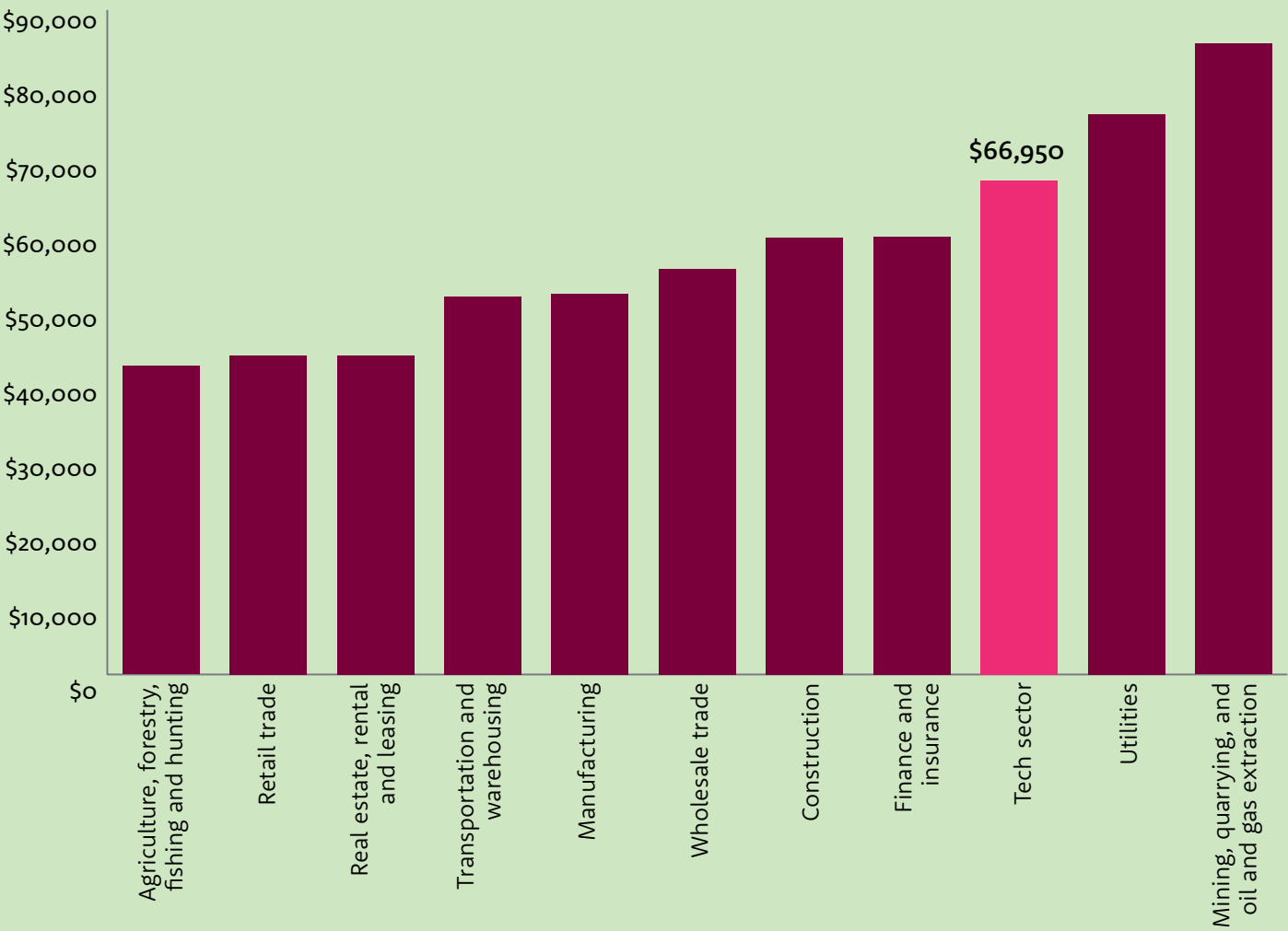
According to the 2015 Statistics Canada’s Labour Force Survey, the tech sector was comprised of the most highly educated members of the labour force: over 50 percent of tech sector employees (aged 15 and over) had a university education.

This was over 4.5 percentage points higher than the corresponding proportion in the finance and insurance industry, and nearly 22 percentage points higher than the average across all industries.

EARNINGS

Figure 23:

Average Estimated Annual Wage, 2015



Statistics Canada Labour Force Survey Custom Tabulation, BII+E Analysis

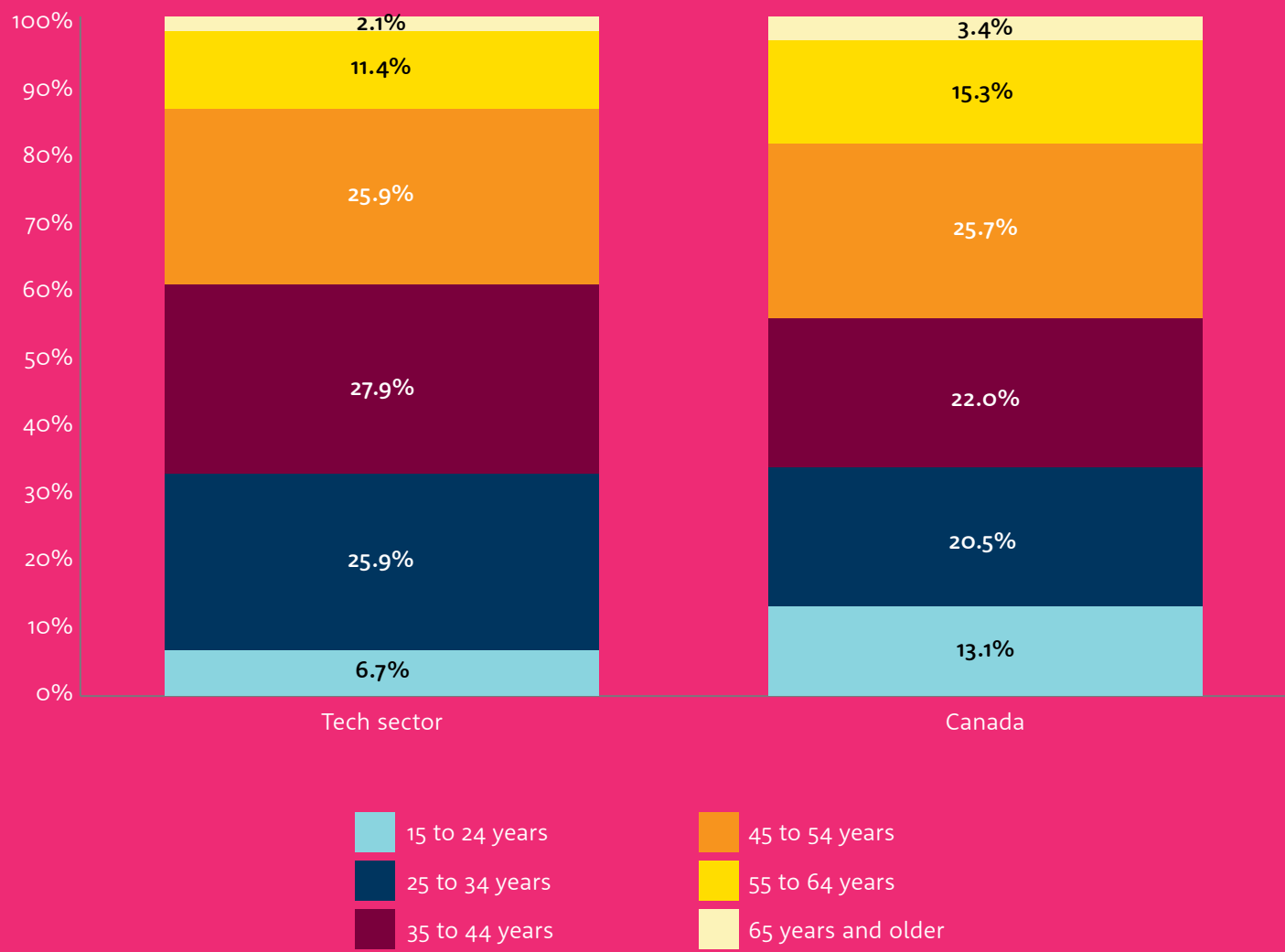
When comparing the average estimated annual wage of different Canadian industries, tech employees are comparatively high earners. On average they earned \$7,760 more per year than finance and insurance employees and \$15,420

more per year than manufacturing employees. Average estimated annual wage was calculated by multiplying the average weekly wage by the 52 weeks in a year.



AGE DISTRIBUTION

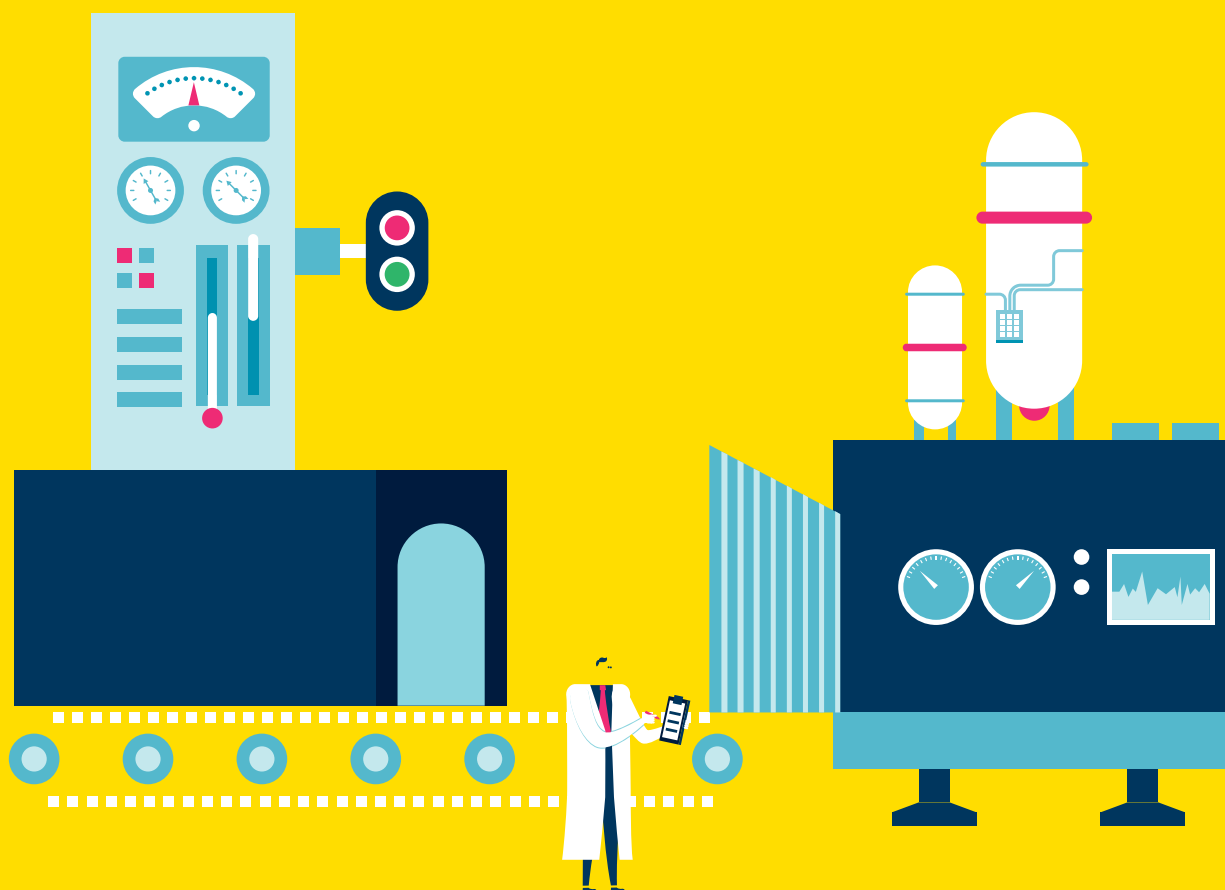
Figure 24:
Age Distribution, 2011



National Household Survey 2011, 99_012_X2011034, BII+E Analysis

According to our analysis of Canada’s 2011 National Household Survey, the average tech sector employee was more likely than the average Canadian employee to be a prime aged worker, aged between 25 and 54. In fact, 79.7 percent of

tech workers fell into this category compared to 68.1 percent across the Canadian economy. In addition, the proportion of employed Canadians across the entire economy older than 55 was 5.2 percentage points greater than in the tech sector.



Angel and venture capital are crucial contributors to the early success of tech startups, providing them with the financing they need to realize their growth potential. In this section, we used data from Canada's National Angel Capital Organization (NACO Canada) and the Canadian Venture Capital & Private Equity Association (CVCA) to demonstrate the state of Canada's risk capital system.

ANGEL CAPITAL

Angel investors are either individuals or groups that fund firms in very early stages of development in exchange for equity. They also offer valuable resources such as mentorship and access to

networks. In 2014, 30 Canadian Angel groups reported 237 investments and 217 deals in 181 companies, for a combined value totalling \$90.5 million. This represented a 2 percent increase in funding and 17 percent increase in the number of investments from the previous year. More than 80 percent of angel investments were in two sectors: ICT and life sciences; 3 percent of investments were in clean tech.¹⁶

VENTURE CAPITAL

Venture capital is a type of private equity from investors or specialized financial institutions that provides capital for small, high-risk firms. Compared to angel investments, venture capital is often larger and focused on later stage firms.

In 2015, Canadian venture capital investment reached a record level. Compared to the previous year, the number of venture capital deals was up 24 percent to 536 deals with a value of nearly \$2.3 billion. More than 38 percent of the deals were in Ontario, followed by 31 percent in Quebec and 16 percent in British Columbia.¹⁷

ICT was by far the most popular sector for venture capital, attracting 60 percent of Canada's total investments. The industries that follow ICT are, in order of investment, life sciences, clean tech, and agribusiness. The only sector to experience contraction was clean tech which had a small drop in deals between 2014 and 2015, and a large drop in total investment between 2013 and 2015.¹⁸

A full 66 percent of venture capital deals were considered seed and early stage, divided equally between each stage. However, total seed funding was \$154 million compared to the \$1.16 billion invested in early stage deals. While seed and early stage funding has been growing since 2013, later stage funding dropped from 78 deals valued at a total of \$785 million in 2014 to 64 deals valued at a total of \$530 million in 2015. Finally, bridge funding deals have more than doubled in number since 2014, but total bridge funding remained fairly low at \$129 million.¹⁹

Since 2013, the number and value of mergers and acquisitions rose to a total of 33 deals, valued at more than \$1.4 billion. The number of IPOs stayed consistent at four per year since 2013, but the total value of IPOs more than tripled to over \$2.9 billion.²⁰

INTERNATIONAL COMPARISONS

According to the Organization for Economic Co-operation and Development, Canada ranks low in the amount of value added by the ICT sector to Canada's national income, ranking 20th out of 29 international peers in 2013.



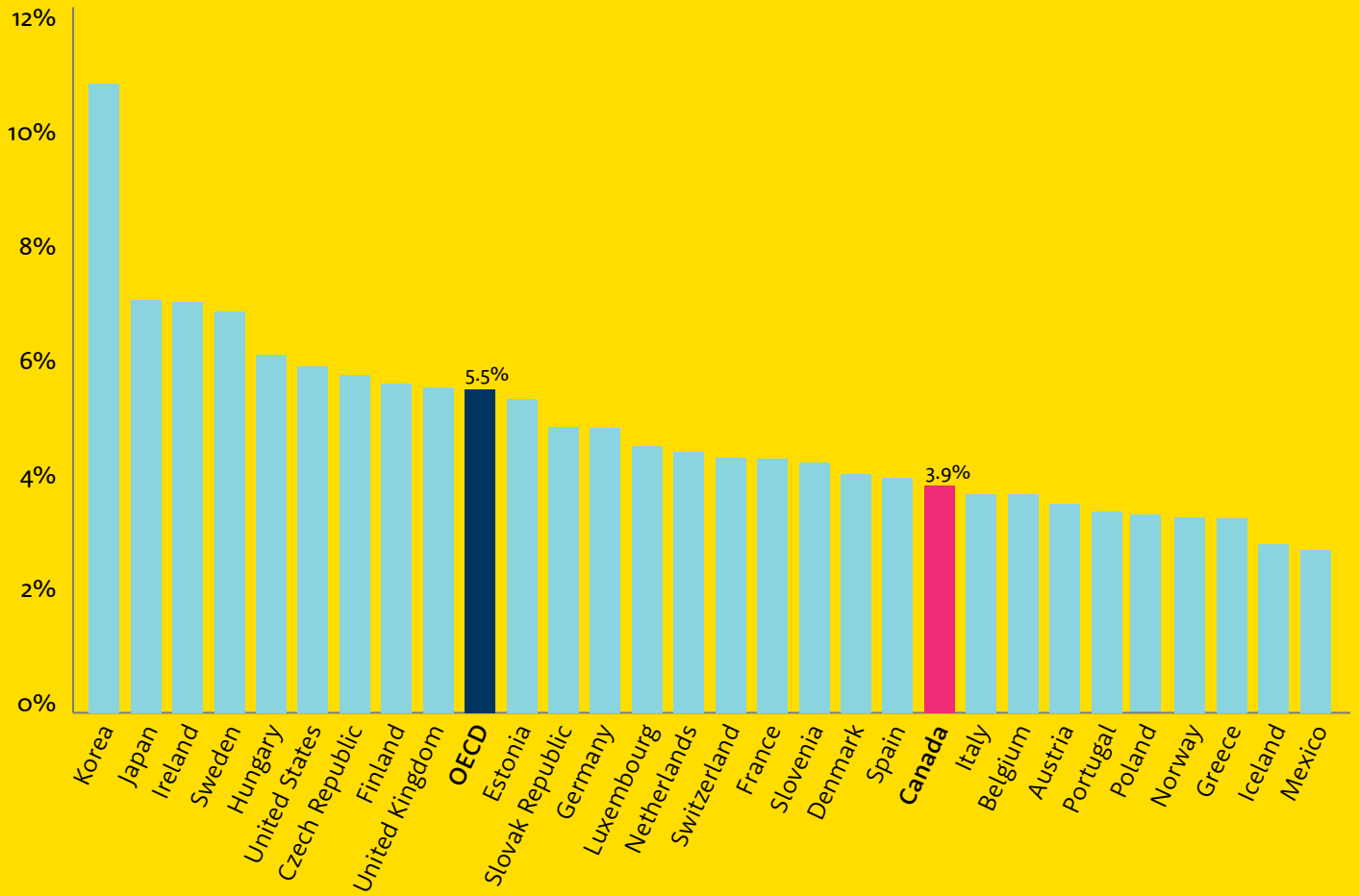
In addition to analyzing the domestic performance of Canada's tech sector, there is value in understanding how Canada's tech sector stacks up in an international context. Since our definition of the tech sector is specific to the Canadian context, ICT will again be used as a proxy.

According to the Organization for Economic Co-operation and Development (OECD), Canada ranked low (20th out of 29 international peers in 2013) in terms of the amount of value added by the ICT sector to Canada's national income.²¹

As this report asserts, the ICT sector is an important component of Canada's labour market. However, compared to its international peers, Canada employs a lower proportion of its total workforce in ICT. In 2013, Canada ranked 18th overall in terms of employment in ICT.²² Interestingly, in 2014, 4.7 percent of Canada's total workforce were ICT specialists, the sixth highest among its peers.²³

Figure 25:

Share of ICT Sector in Total Value Added, 2013



OECD Digital Economy Outlook 2015, BII+E Analysis

PROFILING CANADA'S CITIES



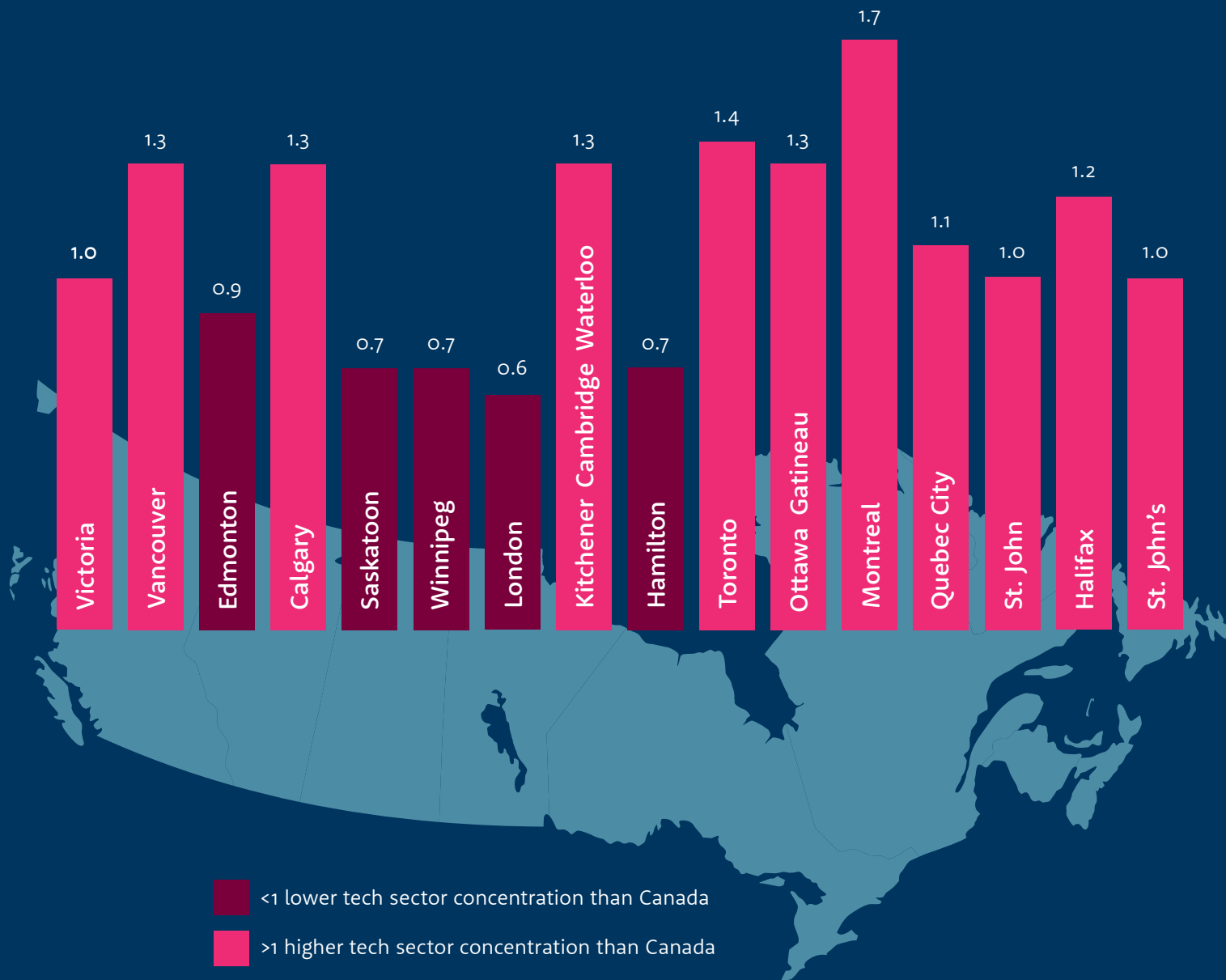
This section profiles the tech sector in select census metropolitan areas (CMAs) in Canada and was conducted using a custom aggregation of the Labour Force Survey (LFS) for all of 2015. The following cities were chosen based on tech sector employment being among the top five local industries studied as well as their geographic location and population size.

The map shows the location quotient of each city's tech sector. A location quotient quantifies how concentrated an industry is in a region compared to a larger geographic area. A location quotient of

1 indicates that the concentration of tech sector employment in the region is the same as Canada's concentration of tech sector employment. A location quotient exceeding 1 indicates tech sector employment is more concentrated than the rest of Canada.

The top Canadian cities in terms of tech sector concentration are Montreal, Toronto, Vancouver, Calgary, Ottawa Gatineau and Kitchener Cambridge Waterloo. Amongst the cities studied, the tech sector is least concentrated in London, Winnipeg, Hamilton and Saskatoon.

TECH SECTOR CONCENTRATION ACROSS CANADA



Statistics Canada Labour Force Survey Custom Tabulation, BII+E Analysis

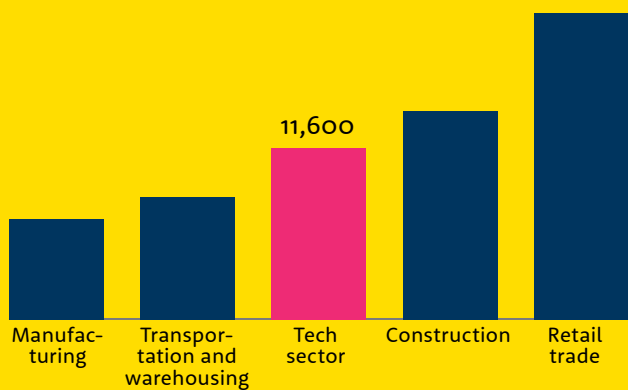
Most major urban centres in Canada have a higher concentration of tech professionals than Canada as a whole. The data shows that some cities close to one another have very different levels of concentration, like Toronto and Hamilton, and

Vancouver and Victoria. Also, most cities in Alberta and Saskatchewan have relatively lower tech sector concentrations compared to those in Ontario and Quebec. Interestingly, despite the relatively small populations of the maritime cities studied, they have relatively high concentrations of tech sector employment.

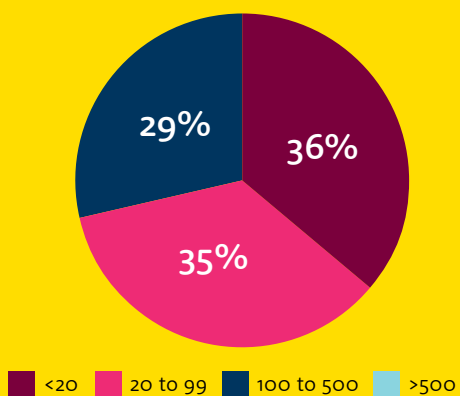


Victoria, BC

Top 5 Private Sector Employers

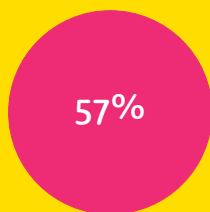


Employment by Firm Size



Workforce

Victoria Tech Sector



vs

Canadian Tech Sector



University education



vs

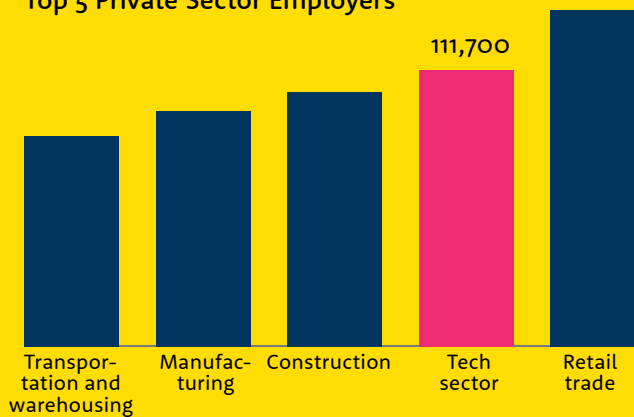


Average annual wage

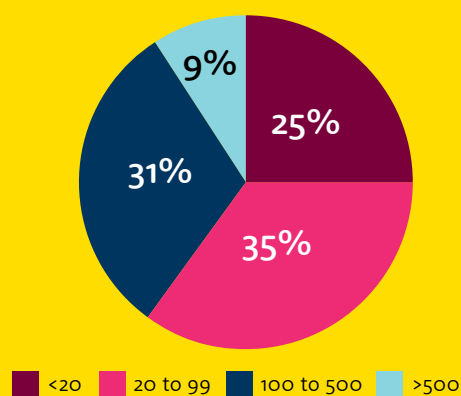


Vancouver, BC

Top 5 Private Sector Employers

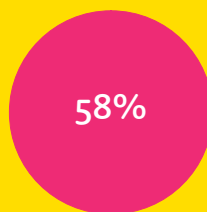


Employment by Firm Size



Workforce

Vancouver Tech Sector



vs

Canadian Tech Sector



University education

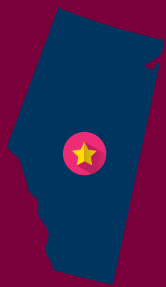


vs



Average annual wage





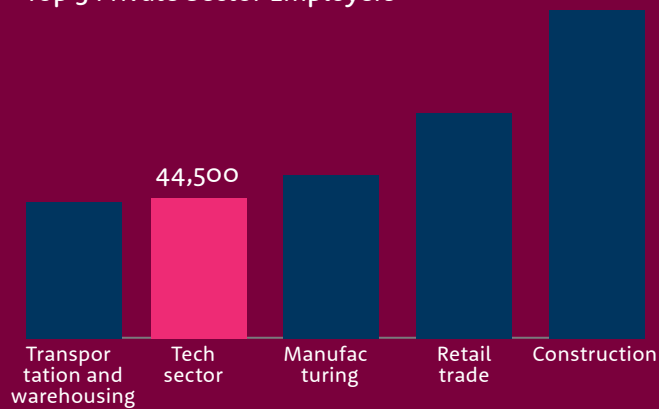
Edmonton, AB



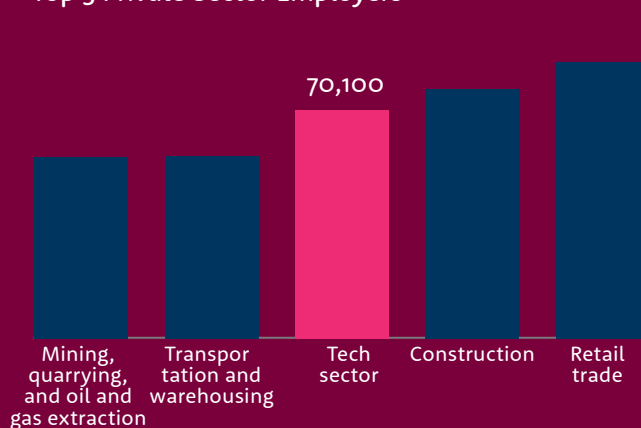
Calgary, AB



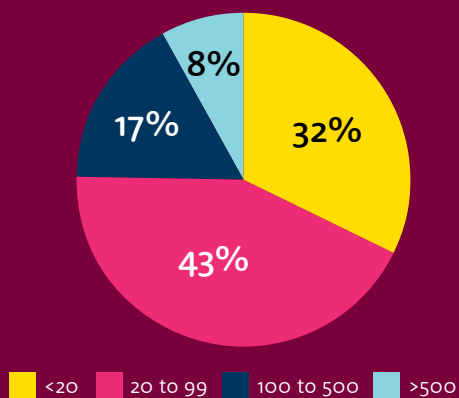
Top 5 Private Sector Employers



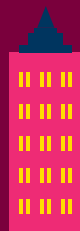
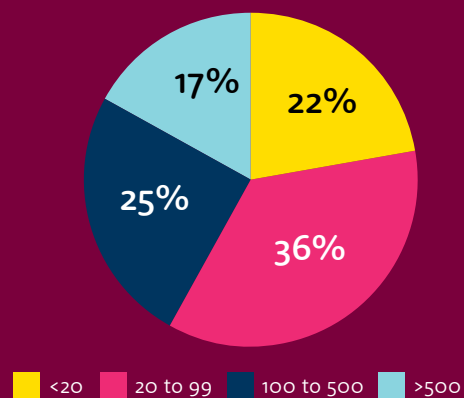
Top 5 Private Sector Employers



Employment by Firm Size



Employment by Firm Size



Workforce

Edmonton Tech Sector

Canadian Tech Sector



vs



University education



vs



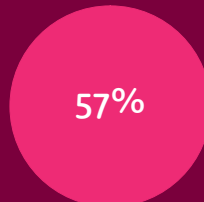
Average annual wage



Workforce

Calgary Tech Sector

Canadian Tech Sector



vs



University education

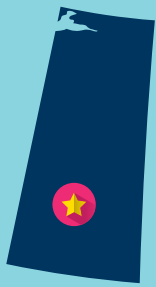


vs



Average annual wage





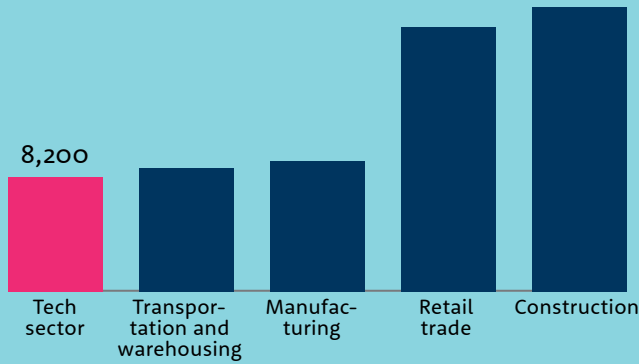
Saskatoon, SK



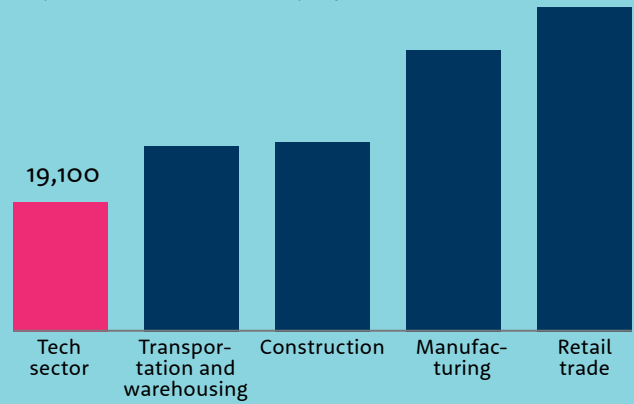
Winnipeg, MB



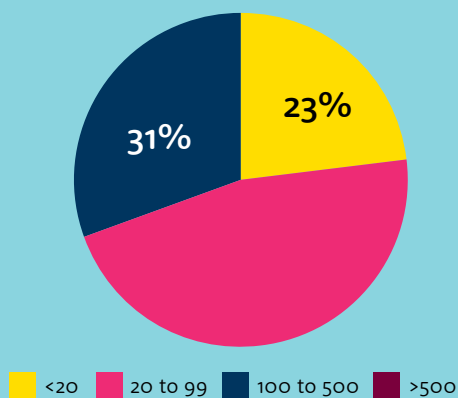
Top 5 Private Sector Employers



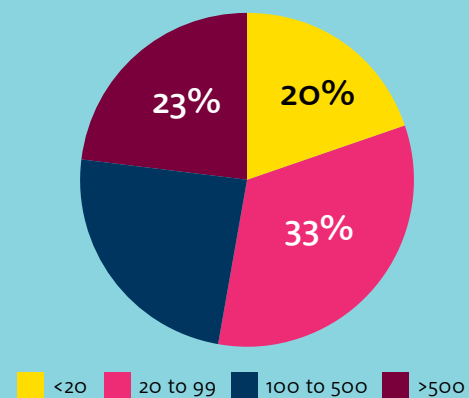
Top 5 Private Sector Employers



Employment by Firm Size

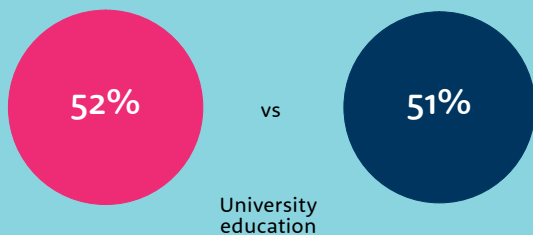


Employment by Firm Size



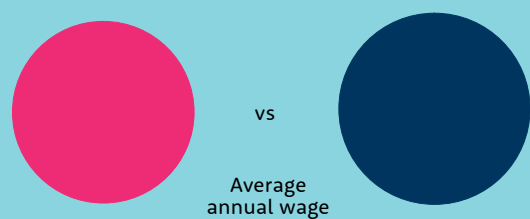
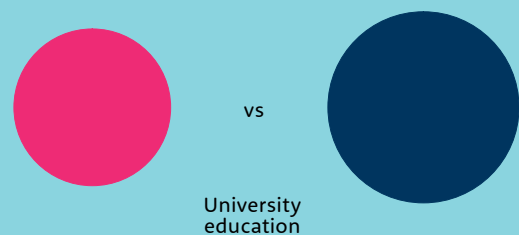
Workforce

Saskatoon Tech sector vs Canadian Tech Sector



Workforce

Winnipeg Tech Sector vs Canadian Tech Sector





London, ON



Kitchener,
Waterloo,
Cambridge, ON



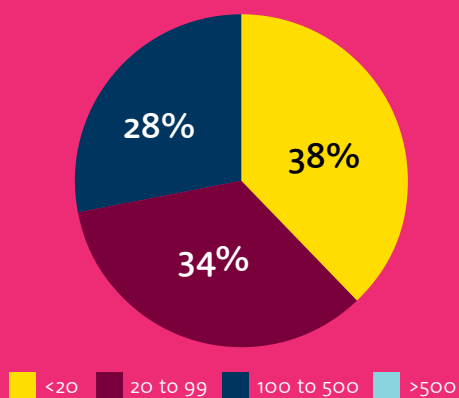
Top 5 Private Sector Employers



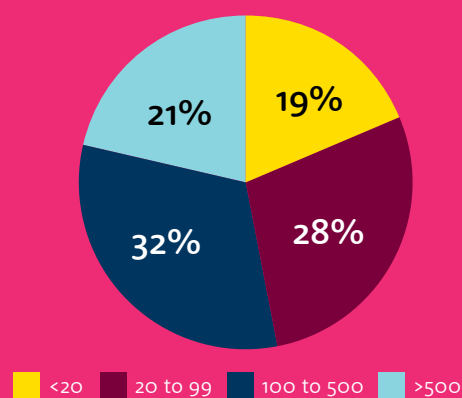
Top 5 Private Sector Employers



Employment by Firm Size



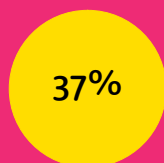
Employment by Firm Size



Workforce

London Tech Sector

Canadian Tech Sector



vs



University education



vs

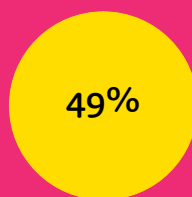


Average annual wage

Workforce

K W C Tech Sector

Canadian Tech Sector



vs



University education



vs



Average annual wage



Hamilton, ON



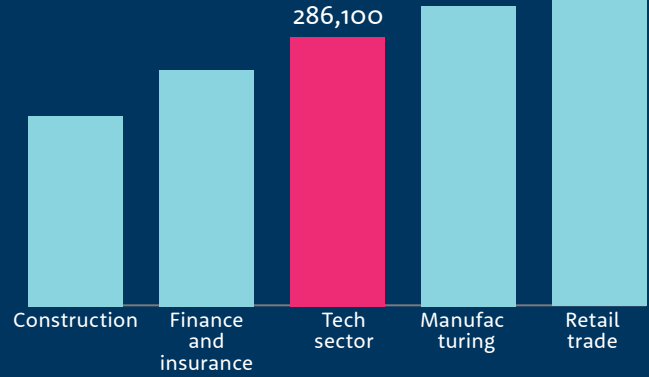
Toronto, ON



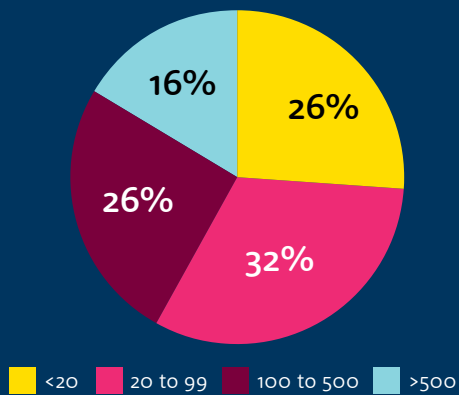
Top 5 Private Sector Employers



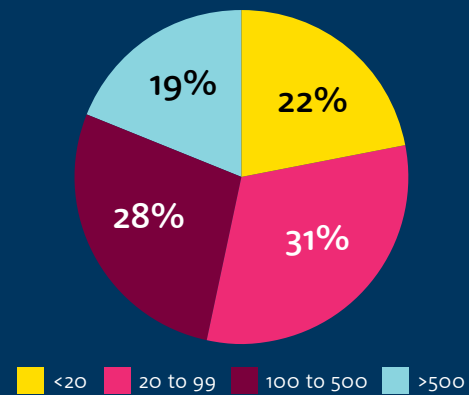
Top 5 Private Sector Employers



Employment by Firm Size



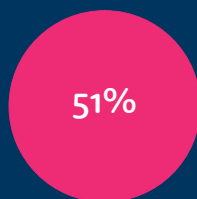
Employment by Firm Size



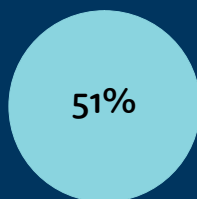
Workforce

Hamilton Tech Sector

Canadian Tech Sector



vs



University education



vs



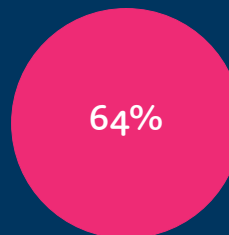
Average annual wage



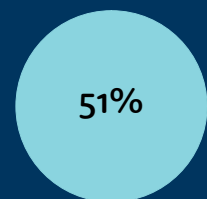
Workforce

Toronto Tech Sector

Canadian Tech Sector



vs



University education



vs



Average annual wage



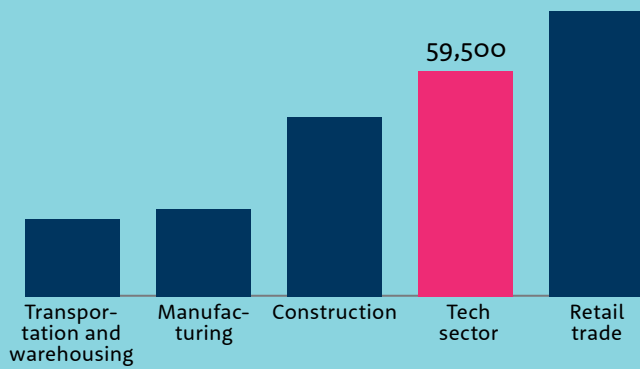


Ottawa-Gatineau, ON

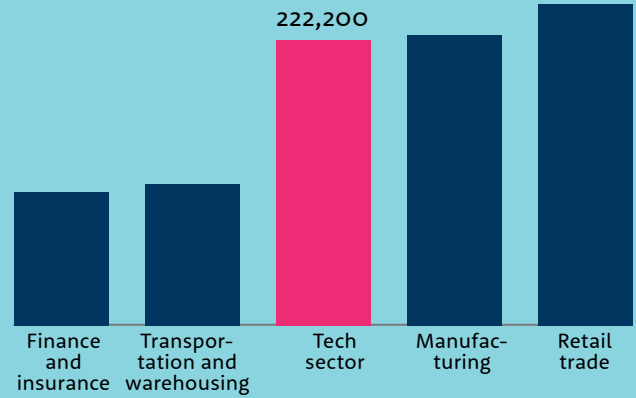
Montreal, QC



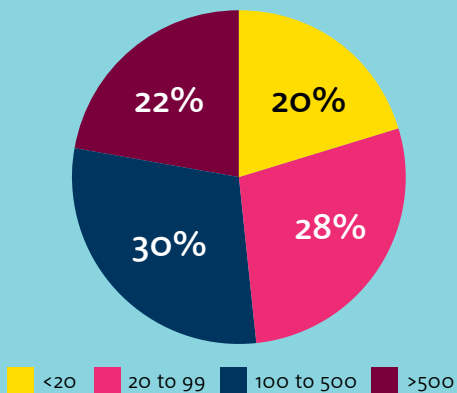
Top 5 Private Sector Employers



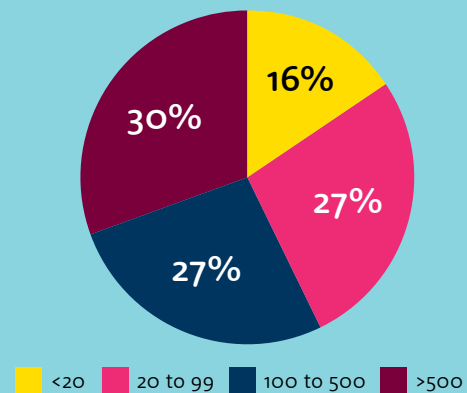
Top 5 Private Sector Employers



Employment by Firm Size



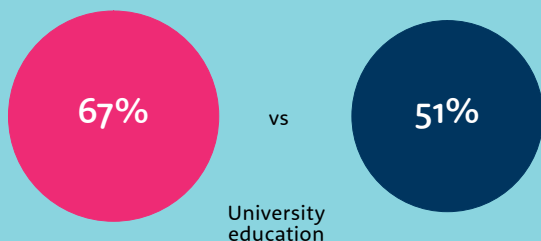
Employment by Firm Size



Workforce

O-G Tech Sector

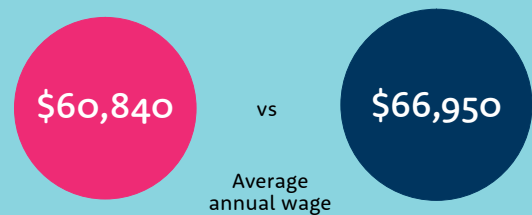
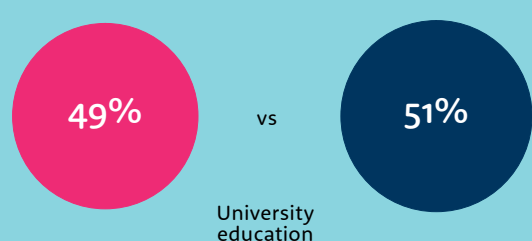
Canadian Tech Sector



Workforce

Montreal Tech Sector

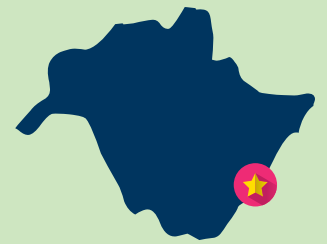
Canadian Tech Sector



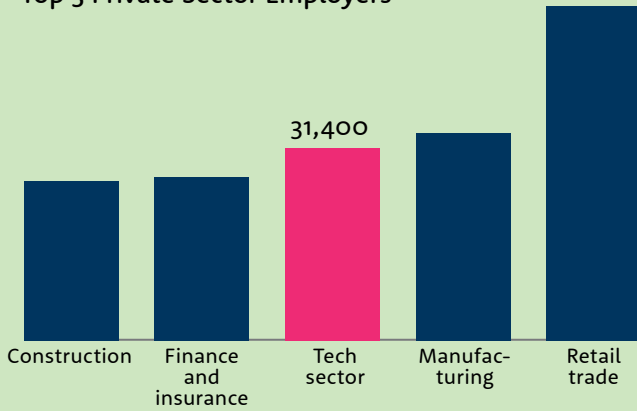


Quebec City, QC

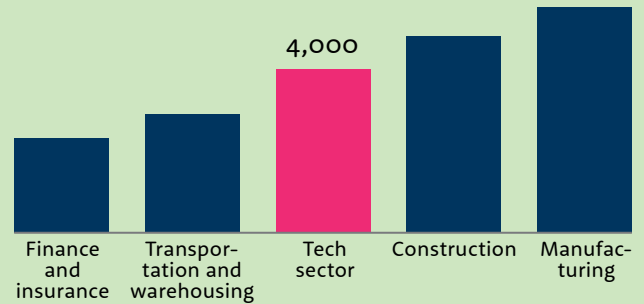
St. John, NB



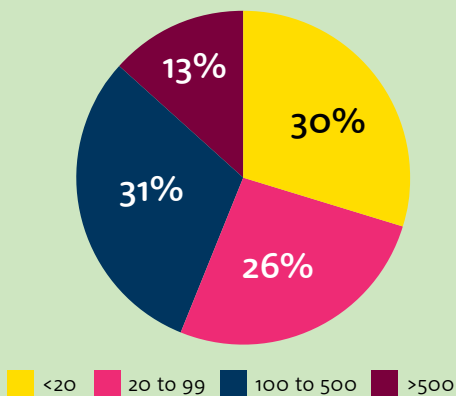
Top 5 Private Sector Employers



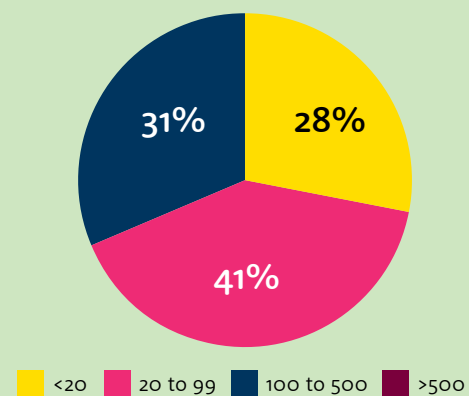
Top 5 Private Sector Employers



Employment by Firm Size

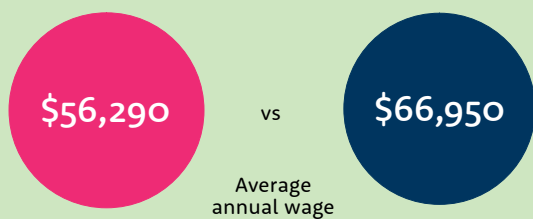
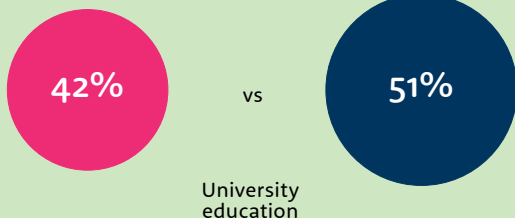


Employment by Firm Size



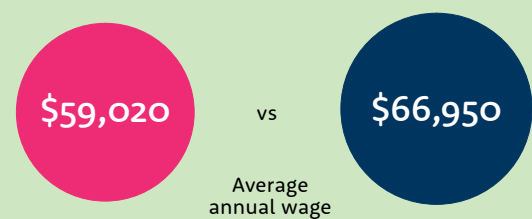
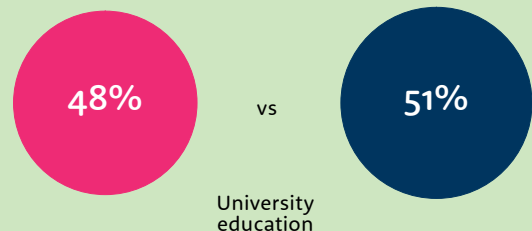
Workforce

Quebec City Tech Sector vs Canadian Tech Sector



Workforce

St. John Tech Sector vs Canadian Tech Sector





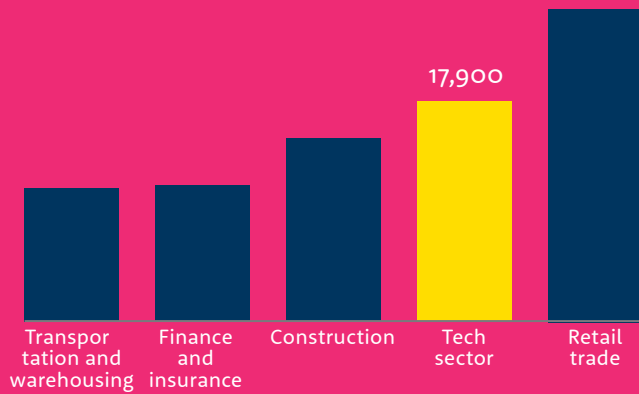
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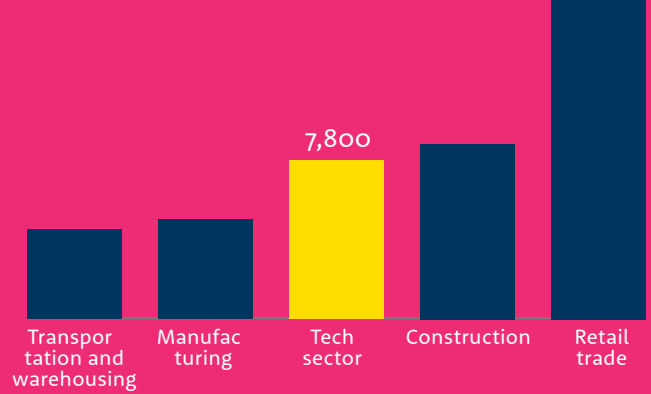
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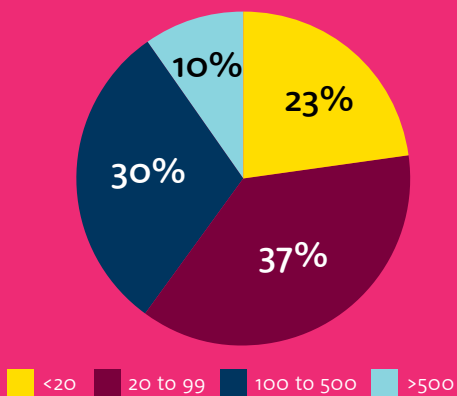
Top 5 Private Sector Employers



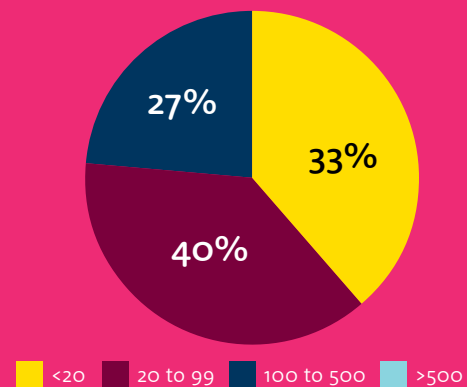
Top 5 Private Sector Employers



Employment by Firm Size



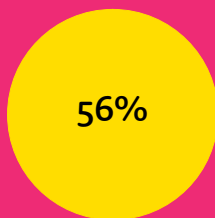
Employment by Firm Size



Workforce

Halifax Tech Sector

Canadian Tech Sector



vs



University education



vs



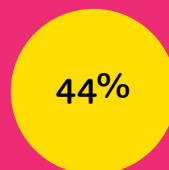
Average annual wage



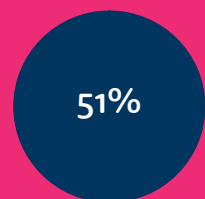
Workforce

St. John's Tech Sector

Canadian Tech Sector



vs



University education



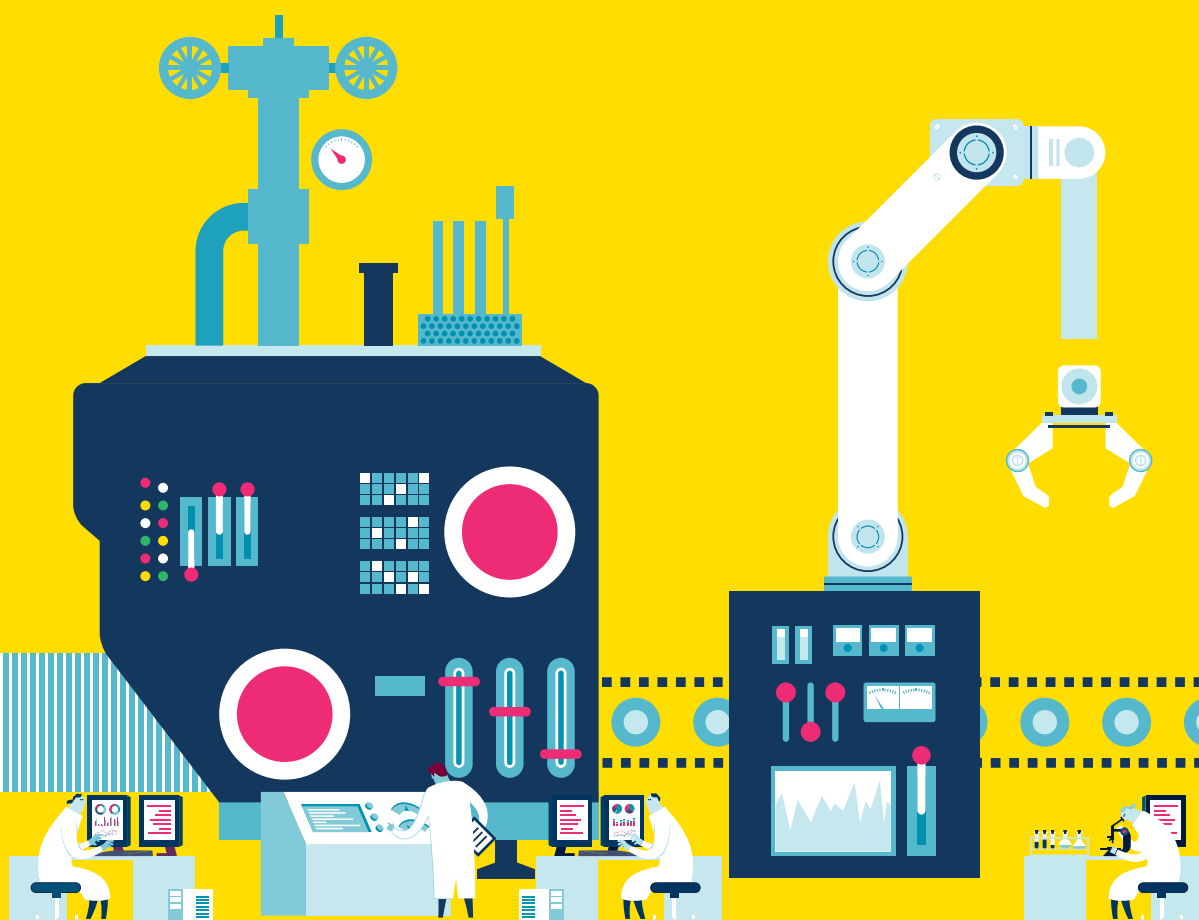
vs



Average annual wage



CONCLUSION AND RECOMMENDATIONS



Throughout this report we have demonstrated that Canada's tech sector is a significant contributor to the country's success and is a cornerstone of its growing knowledge economy. It is a diverse sector made up of a wide array of industries, ranging from ICT to aerospace manufacturing. These industries also have much in common, including a reliance on knowledge, research and development, and rapid innovation to thrive and remain competitive.

Overall, this report describes the tech sector's significant impact on Canada's economy. In 2015:

- The tech sector was directly responsible for \$117 billion or 7.1 percent of Canada's economic output, greater than that of the finance and insurance industry.
- 864,000 Canadians were employed in the tech sector, which made up 5.6 percent of Canada's total employment.
- At over \$9.1 billion, the tech sector was by far the largest private sector investor in research and development.
- The tech sector was also comprised of nearly 71,000 firms, representing 6.1 percent of all Canadian businesses.
- Tech sector employees earned approximately \$67,000 a year, compared to the national average of nearly \$48,000.

While our findings suggest that Canada's tech sector is a diverse, critical component of the economy, until now, it has lacked a common pan Canadian definition. Moving forward we would like to offer these recommendations that aim to better define and understand the tech sector:

1. For the purposes of defining and tracking the tech sector, we recommend that Statistics Canada develop a custom aggregation of the tech sector, similar to ICT. This aggregation could be applied to a number of existing surveys to gather data on productivity, firm age, advanced technology, etc. This would enable all interested parties to track a wider array of indicators of tech sector performance with greater accuracy. This is important since the issues we encountered in accessing data from some Statistics Canada surveys, due to suppression and restricted availability, often meant we were unable to track certain indicators. This resulted in an inability to accurately assess specific components of the tech sector.
2. Future work might also consider applying an R&D threshold in addition to the existing tech employment threshold to potentially increase the accuracy of the definition of Canada's tech sector.

As technology continues to grow and become more ubiquitous throughout Canada's economy, it is increasingly important to understand the economic significance of the country's tech sector. The goal of *The State of Canada's Tech Sector* is to help identify the composition and economic impact of Canada's tech sector in its entirety.

But much like the technology that drives the tech sector, its constituent industries will continue to grow and innovate. Moving forward, it will be important to monitor the year after year activity of Canada's tech sector to provide up to date information on this dynamic and economically significant sector.

APPENDIX :

THE STATE OF CANADA'S TECH SECTOR DYNAMIC MAPPING EXERCISE

INTRODUCTION

When we began to measure the state, composition and economic contribution of Canada's tech sector, we started by looking for a common definition of the tech sector from which to conduct our analysis. We found that beyond ICT there was no Canada-specific measure of the tech sector.

To develop a definition of Canada's tech sector, we conducted a 'dynamic mapping exercise'. This analysis identifies an industry's employment proportion of tech occupations, and classifies those above a threshold as members of the tech sector.

The dynamic mapping exercise is rooted in Nesta's work determining the makeup of the creative industry. In their exercise, much like ours, they define creative occupations and determine 'creative intensity' as the proportion of creative occupations in any given industry. Other organizations, such as the Brookings Institution and the United States Bureau of Labor Statistics (BLS), have employed similar exercises to decide which industries are part of the advanced and high-technology industries.

This appendix describes the dynamic mapping exercise that we conducted, as follows:

Step 1: Determine which occupations are considered 'technology occupations'.

Step 2: Map technology occupations against industries to determine the industries with the highest proportion of tech occupations, termed their 'tech intensity'.

Step 3: Determine the industrial composition of the tech sector based on the proportion of tech occupations.

IDENTIFYING TECH OCCUPATIONS

The first step of the dynamic mapping exercise involved defining tech occupations. For the purposes of this study, tech occupations were defined as occupations that involve the use of high-tech equipment, or the development of high-tech outputs, or both. Borrowing from a 2015 report from BC Stats, high-tech was defined

as “technology that is at the cutting edge and is usually associated with strong economic growth and advanced technological development.”²⁴

To identify specific tech occupations, we employed National Occupation Classification (NOC) data. Our first step was to examine each NOC category using Employment and Social Development Canada’s (ESDC) occupation descriptions to determine if they were users or developers of high technology. The second step was to assess each of these occupations using four evaluation criteria: (1) use of science, technology, engineering and math (STEM)

knowledge base to perform their main duties, (2) engaged in R&D, (3) strong understanding and use of high-tech equipment, (4) highly engaged in the production of high-tech outputs.

These criteria were developed based on a description of the functions of high-tech occupations by the BLS. Each occupation was ascribed a 1 if it fit the criteria or a 0 if it did not. Those occupations whose cumulative score was greater than or equal to 3 were included in our NOC-based definition of tech occupations. Table 2 details the tech occupations that fulfilled those criteria.

Table 2:
Tech Occupations that fulfill at least 3 out of 4 Criteria

NOC	Occupation	STEM knowledge base to perform their main duties	Engaged in R&D	Strong understanding and use of high tech equipment	Highly engaged in producing high-tech outputs	Score
0131	Telecommunication carriers managers	1	0	1	1	3
0211	Engineering managers	1	1	1	1	4
0212	Architecture and science managers	1	1	1	1	4
0213	Computer and information systems managers	1	1	1	1	4
2111	Physicists and astronomers	1	1	1	1	4
2112	Chemists	1	1	1	1	4
2113	Geoscientists and oceanographers	1	1	1	0	3
2114	Meteorologists and climatologists	1	1	1	0	3
2115	Other professional occupations in physical sciences	1	1	1	0	3
2121	Biologists and related scientists	1	1	1	1	4
2132	Mechanical engineers	1	0	1	1	3
2133	Electrical and electronics engineers	1	0	1	1	3
2134	Chemical engineers	1	1	1	1	4
2142	Metallurgical and materials engineers	1	1	1	1	4
2146	Aerospace engineers	1	1	1	1	4
2147	Computer engineers (except software engineers and designers)	1	1	1	1	4
2148	Other professional engineers, n.e.c.*	1	1	1	1	4
2161	Mathematicians, statisticians and actuaries	1	1	1	0	3
2171	Information systems analysts and consultants	1	0	1	1	3
2172	Database analysts and data administrators	1	0	1	1	3
2173	Software engineers and designers	1	0	1	1	3
2174	Computer programmers and interactive media developers	1	0	1	1	3
2175	Web designers and developers	1	0	1	1	3
2211	Chemical technologists and technicians	1	1	1	0	3
2221	Biological technologists and technicians	1	1	1	0	3
5223	Graphic arts technicians	1	0	1	1	3
5241	Graphic designers and illustrators	1	0	1	1	3

* not elsewhere classified

MAPPING EMPLOYMENT CODES WITH INDUSTRY CODES

Once we had a clear understanding of which occupations are considered technology occupations, we mapped them against 4 digit NAICS codes, using a custom tabulation of Statistics Canada's National Household Survey, 2011.²⁵ This process was used to determine each industry's tech intensity.

We began our approach for selecting a tech intensity threshold by emulating the BLS which used a multiple of the national tech intensity to determine the threshold used to classify an industry as a member of the tech sector. The BLS used twice the national average as their minimum threshold for high-tech intensity.

We began with a threshold of three times the Canadian national average to apply an even stricter standard. We also applied criteria employed by Nesta when identifying information economy industries to ensure our definition appropriately captured Canada's tech sector.²⁶ Therefore, our threshold of 15 percent tech employment was informed by: (1) a multiple of the national average, (2) a natural divide in the distribution of lower and higher intensity industries, and (3) the nature of industries that exceeded our threshold.

The following table shows the industries that are above our threshold.

Table 3:
NAICS Industries Exceeding 15 Percent Tech Intensity

NAICS Code	Industry	Proportion
5415	Computer systems design and related services	61.18%
5112	Software publishers	59.94%
5417	Scientific research and development services	38.96%
5414	Specialized design services	38.77%
3342	Communications equipment manufacturing	33.12%
4173	Computer and communications equipment and supplies wholesaler-distributors	31.99%
5182	Data processing, hosting, and related services	31.68%
3254	Pharmaceutical and medicine manufacturing	25.23%
3346	Manufacturing and reproducing magnetic and optical media	24.37%
5413	Architectural, engineering & related services	23.69%
3345	Navigational, measuring, medical and control instruments manufacturing	22.01%
3341	Computer and peripheral equipment manufacturing	21.53%
3333	Commercial and service industry machinery manufacturing	21.37%
5179	Other telecommunications	20.68%
5171	Wired telecommunications carriers	18.85%
5174	Satellite telecommunications	18.51%
3344	Semiconductor and other electronic component manufacturing	17.69%
5172	Wireless telecommunications carriers (except satellite)	17.09%
3343	Audio and video equipment manufacturing	16.32%
3364	Aerospace product and parts manufacturing	16.05%
5261	Pension funds	15.53%
3251	Basic chemical manufacturing	15.05%

RESULTS

Our results show that Canada has a broad tech sector outside of ICT. Following this exercise, we performed a few minor adjustments to the definition to accommodate the reality of available data and better reflect our understanding of the tech sector.

To ensure our larger definition of the tech sector encompasses all of ICT and, therefore, enabled us to use a wider number of datasets, we included one industry that did not meet our threshold: electronic and precision equipment repair and maintenance (NAICS code 8112). By adding this industry, we could use an “ICT-plus” model of the tech sector which encompasses the Statistics

Canada ICT NAICS aggregate plus the additional industries in our definition of the tech sector.

Pension Funds (NAICS code 5261) were excluded from our final definition of the tech sector for two reasons. First, pension funds are not included in most measures and data availability issues would make it difficult to estimate. Second, for industry comparisons, we felt pension funds were far more relevant to the financial services industry than to the tech sector.

The following table outlines our final definition of Canada’s tech sector.

Table 4:
Canada’s Tech Sector

Industry Group	NAICS Code	Description
Aerospace Manufacturing	3364	Aerospace product and parts manufacturing
Architecture, engineering and design	5413 5414	Architectural, engineering & related services Specialized design services
Chemical & Pharmaceutical Manufacturing	3251 3254	Basic chemical manufacturing Pharmaceutical and medicine manufacturing
Information and Communications Technology (ICT)	3341 3342 3343 3344 3346 4173 5112 5171 5172 5174 5179 5182 5415 8112	Computer and peripheral equipment manufacturing Communications equipment manufacturing Audio and video equipment manufacturing Semiconductor and other electronic component manufacturing Manufacturing and reproducing magnetic and optical media Computer and communications equipment and supplies wholesaler-distributors Software publishers Wired telecommunications carriers Wireless telecommunications carriers (except satellite) Satellite telecommunications Other telecommunications Data processing, hosting, and related services Computer systems design and related services Electronic and precision equipment repair and maintenance
Machinery & Specialized Manufacturing	3333 3345	Commercial and service industry machinery manufacturing Navigational, measuring, medical and control instruments manufacturing
Scientific R&D	5417	Scientific research and development services

CONSIDERATIONS

While we are confident in our definition, there are limitations associated with our approach. Using a NAICS-based industry definition may leave out new and emerging tech firms that are members of industries that did not meet our threshold. In addition, those employed in technology occupations in industries that are not part of the tech sector are also not included in this analysis.

Due to data limitations, we were also unable to define industries beyond 4 digit NAICS codes. This may result in smaller non tech industries being included in our tech sector definition. More detailed industry codes would offer our definition improved accuracy.

E N D N O T E S

1. Bakhshi, et al., 2013.
2. Hecker, 2005.
3. Harris, 1999, p. 3.
4. OECD, 2015b, p. 11.
5. Conference Board of Canada, 2015a.
6. Council of Canadian Academies, 2009, p. 27.
7. Science, Technology and Innovation Council, 2015, p. 19.
8. Leung et al., 2008, p. 5.
9. Baldwin et al., 2014, p. 6.
10. OECD, 2002, p. 69.
11. Mazzucato, 2013, p. 42.
12. Council of Canadian Academies, 2013b, p. xi.
13. Conference Board of Canada, 2015b.
14. Science, Technology and Innovation Council, 2015, p. 1.
15. Nesta, 2009, p. 3.
16. NACO, 2015, pp. 5- 6.
17. CVCA, 2015, pp. 1-2.
18. Ibid., p. 5-6.
19. Ibid., p. 7.
20. Ibid., p. 8.
21. OECD, 2015a, p. 42.
22. Ibid., p. 89.
23. Ibid., p. 46.
24. Schrier & Hallin, 2015, p. 7.
25. Canada's 2011 National Household Survey is the latest survey available that provides detailed and accurate enough industry and occupational information.
26. Spilsbury, 2015, p.18.

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